



Arizona's Economic Future

Prepared For
The Arizona Department of Commerce

Prepared By
Economy.com, Inc.

August 2002

ECONOMY
.COM

600 WILLOWBROOK LANE
SUITE 600
WEST CHESTER, PA 19382-5500
PHONE: 610.696.8700

Arizona's Economic Future

Table of Contents

Executive Summary	1
1. Arizona's Economy Today – End Of A Cycle; Beginning Anew	3
1.1. Current Economic Trends	3
1.2. Arizona's Economic Structure	5
2. The Broader View	10
2.1. The Macroeconomic Outlook	10
2.2. Business Practices	19
2.3. The Global Economic Environment	20
3. Arizona's Future At Risk	28
3.1. Arizona Within the U.S. and Global Environment	28
3.2. Dependency Upon Migration and Growth	31
3.3. Education and Workforce Quality	34
4. Methodology – Arizona's Comparative Advantages	40
4.1. Analytical Methodology	40
4.2. Factors of Comparative Advantage	40
4.3. Arizona's Measures of Comparative Advantage	42
4.3.1 Business Climate and Quality of Life	42
4.3.2 Infrastructure	49
4.3.3 Health, Poverty and Crime	56
4.3.4 Demographics	61
4.3.5 Credit Quality and Household Balance Sheets	68
5. Economic Opportunities	70
5.1. Computer Software and Systems	71
5.2. Healthcare and Biotechnology	73
5.3. Industrial Machinery	79
5.4. Communication Services	80
5.5. High-tech Instruments	81
5.6. Forest Products	81
5.7. Engineering Services – Research and Testing	82
5.8. Transportation and Logistics	83
5.9. Agriculture/Food Processing/Agricultural Technology	85
5.10. Defense/Aerospace/Avionics	86
6. Economic Outlook	87
7. Foundational Issues	91
7.1. Tourism	91
7.2. Financial Services	92
7.3. Education and Workforce Quality	92
7.4. Healthcare	93

8. Regional Briefings	93
8.1. Maricopa Association of Governments (Maricopa County)	93
8.1.1 Current economic trends	93
8.1.2 Industrial Structure	94
8.1.3 Measures of Comparative Advantage	96
8.1.3.1 Population	96
8.1.3.2 Income	96
8.1.3.3 Cost of Doing Business	98
8.1.3.4 Cost of Living	99
8.1.3.5 Education and Workforce Quality	100
8.1.3.6 Health, Welfare and Crime	102
8.1.3.7 Infrastructure	102
8.1.4 Economic Opportunities	104
8.1.5 Economic Outlook	105
8.1.6 Foundational Issues	105
8.2. Pima Association of Governments (Pima County)	106
8.2.1 Current economic trends	106
8.2.2 Industrial Structure	106
8.2.3 Measures of Comparative Advantage	108
8.2.3.1 Population	108
8.2.3.2 Income	108
8.2.3.3 Cost of Doing Business	108
8.2.3.4 Cost of Living	110
8.2.3.5 Education and Workforce Quality	110
8.2.3.6 Health, Welfare and Crime	111
8.2.3.7 Infrastructure	113
8.2.4 Economic Opportunities	114
8.2.5 Economic Outlook	115
8.2.6 Foundational Issues	115
8.3. Northern Arizona Council of Governments (Apache, Coconino, Navajo and Yavapi Counties)	116
8.3.1 Current Economic trends	116
8.3.2 Industrial Structure	116
8.3.3 Measures of Comparative Advantage	118
8.3.3.1 Population	118
8.3.3.2 Income	118
8.3.3.3 Cost of Doing Business	119
8.3.3.4 Cost of Living	120
8.3.3.5 Education and Workforce Quality	120
8.3.3.6 Health, Welfare and Crime	121
8.3.3.7 Infrastructure	124
8.3.4 Economic Opportunities	124
8.3.5 Economic Outlook	125
8.3.6 Foundational Issues	125
8.4. Western Arizona Council of Governments (La Paz, Mohave and Yuma Counties)	126
8.4.1 Current economic trends	126
8.4.2 Industrial Structure	126
8.4.3 Measures of Comparative Advantage	128
8.4.3.1 Population	128
8.4.3.2 Income	129

8.4.3.3 Cost of Doing Business	130
8.4.3.4 Cost of Living	131
8.4.3.5 Education and Workforce Quality	131
8.4.3.6 Health, Welfare and Crime.....	133
8.4.3.7 Infrastructure	134
8.4.4 Economic Opportunities	135
8.4.5 Economic Outlook.....	136
8.4.6 Foundational Issues	137
8.5. Central Arizona Council of Governments (Gila and Pinal Counties)	137
8.5.1 Current Economic trends	137
8.5.2 Industrial Structure	137
8.5.3 Measures of Comparative Advantage	138
8.5.3.1 Population.....	138
8.5.3.2 Income	140
8.5.3.3 Cost of Doing Business	140
8.5.3.4 Cost of Living	141
8.5.3.5 Education and Workforce Quality	141
8.5.3.6 Health, Welfare and Crime.....	143
8.5.3.7 Infrastructure	143
8.5.4 Economic Opportunities	145
8.5.5 Economic Outlook.....	145
8.5.6 Foundational Issues	146
8.6. Central Arizona Council of Governments (Gila and Pinal Counties)	147
8.6.1 Current economic trends	147
8.6.2 Industrial Structure	147
8.6.3 Measures of Comparative Advantage	148
8.6.3.1 Population.....	148
8.6.3.2 Income	149
8.6.3.3 Cost of Doing Business	150
8.6.3.4 Cost of Living	151
8.6.3.5 Education and Workforce Quality	151
8.6.3.6 Health, Welfare and Crime.....	153
8.6.3.7 Infrastructure	155
8.6.4 Economic Opportunities	156
8.6.5 Economic Outlook.....	157
8.6.6 Foundational Issues	157

List of Charts:**Page:**

Chart 1: Employment Downturn Worse Than 1991 Recession	3
Chart 2: Manufacturing and Tourism Lead Downturn	4
Chart 3: Arizona Labor Market Conditions Still Weak	4
Chart 4: Income Growth Still Buoyant	5
Chart 5: Little Diversity in Arizona's Economy	6
Chart 6: Arizona's Economic Diversity Not Improving	6
Chart 7: Decomposing Productivity Gains	11
Chart 8: Accelerated Pace of Technological Change	12
Chart 9: R&D Spending Moves Higher	13
Chart 10: Internet Diffuses Rapidly	14
Chart 11: Percent Saving in Internet Mortgage Origination Costs	14
Chart 12: Internet Economics	15
Chart 13: An Increasingly Global Economy	16
Chart 14: Maquiladoras Losing Competitive Edge	23
Chart 15: Foreign Affiliates in Arizona	23
Chart 16: Mexico Dominates Foreign-Born Population in Arizona	24
Chart 17: Other Border States Absorb More of the Nation's Immigrants	25
Chart 18: Dollar Will Fall Further	27
Chart 19: Narrow Range of Exports	30
Chart 20: Five Largest Export Destinations	30
Chart 21: Migration As Source Of Growth	32
Chart 22: Migrants Follow Job Opportunities	33
Chart 23: Educational Attainment	34
Chart 24: Below Average Proficiency in Arizona	36
Chart 25: A College Degree Is Increasingly Valuable	37
Chart 26: Migrants Add to Intellectual Capital	39
Chart 27: Factors of Comparative Advantage	41
Chart 28: Arizona's Business Costs: Right On Average	43
Chart 29: Arizona Business Costs Near Average Among Tech States	44
Chart 30: Arizona Cost Of Living Indexes	45
Chart 31: Arizona's Living Costs Lower Than In Most Tech Centers	46
Chart 32: Arizona Does Not Lack For Innovation	46
Chart 33: Arizona's Innovation In Second Tier Of Tech States	47
Chart 34: Evidence Of Innovation Throughout The State	47
Chart 35: Innovation Gets By Without Venture Capital	48
Chart 36: Arizona Does Not Fare Well For VC Among Tech States	48
Chart 37: Poverty Rate Changes Little	58
Chart 38: Rapid Population Growth	61
Chart 39: Age Structure Of Population	62
Chart 40: Minority Distribution of Population	63
Chart 41: Minority Population Shares, 1990 and 2000	63
Chart 42: Population Growth by Region	64
Chart 43: Net Migration Contribution to Population Change	64
Chart 44: Population Share Over 65 Years Old	65
Chart 45: Per Capita Income Gap Widens	65
Chart 46: Wage and Salary Income Increasingly Important	66
Chart 47: Wage and Salary Income Per Payroll Worker	66
Chart 48: Income Distribution More Evenly Distributed	67
Chart 49: Per Capita Income By Region	67
Chart 50: Real Regional Per Capita Income Growth	68
Chart 51: Credit Quality Worsening Moderately	69
Chart 52: Personal Bankruptcy Filings Per 1,000 Households	69
Chart 53: Population Growth, Maricopa County	97
Chart 54: Income Growth, Maricopa County	97
Chart 55: Cost of Doing Business, Maricopa County	98

List of Charts:**Page:**

Chart 56: Eighth Grade Proficiency, Maricopa County	101
Chart 57: Educational Attainment, Maricopa County	101
Chart 58: Productivity, Maricopa County	101
Chart 59: Poverty Rate, Maricopa County	102
Chart 60: Infant Mortality Rate, Maricopa County	103
Chart 61: FBI Crime Index, Maricopa County	103
Chart 62: Population Growth, Pima County	109
Chart 63: Income Growth, Pima County	109
Chart 64: Cost of Doing Business, Pima County	109
Chart 65: Eighth Grade Proficiency, Pima County	111
Chart 66: Educational Attainment, Pima County	111
Chart 67: Productivity, Pima County	112
Chart 68: Poverty Rate, Pima County	112
Chart 69: Infant Mortality Rate, Pima County	113
Chart 70: FBI Crime Index, Pima County	113
Chart 71: Population Growth, Northern Arizona	118
Chart 72: Income Growth, Northern Arizona	119
Chart 73: Cost of Doing Business, Northern Arizona	120
Chart 74: Eighth Grade Proficiency, Northern Arizona	121
Chart 75: Educational Attainment, Northern Arizona	122
Chart 76: Productivity, Northern Arizona	122
Chart 77: Poverty Rate, Northern Arizona	123
Chart 78: Infant Mortality Rate, Northern Arizona	123
Chart 79: FBI Crime Index, Northern Arizona	123
Chart 80: Population Growth, Western Arizona	128
Chart 81: Income Growth, Western Arizona	129
Chart 82: Cost of Doing Business, Western Arizona	130
Chart 83: Eighth Grade Proficiency, Western Arizona	131
Chart 84: Educational Attainment, Western Arizona	132
Chart 85: Productivity, Western Arizona	132
Chart 86: Poverty Rate, Western Arizona	133
Chart 87: Infant Mortality Rate, Western Arizona	134
Chart 88: FBI Crime Index, Western Arizona	134
Chart 89: Population Growth, Central Arizona	140
Chart 90: Income Growth, Central Arizona	141
Chart 91: Cost of Doing Business, Central Arizona	141
Chart 92: Eighth Grade Proficiency, Central Arizona	142
Chart 93: Educational Attainment, Central Arizona	142
Chart 94: Productivity, Central Arizona	143
Chart 95: Poverty Rate, Central Arizona	144
Chart 96: Infant Mortality Rate, Central Arizona	144
Chart 97: FBI Crime Index, Central Arizona	144
Chart 98: Population Growth, Southeastern Arizona	149
Chart 99: Income Growth, Southeastern Arizona	150
Chart 100: Cost of Doing Business, Southeastern Arizona	151
Chart 101: Eighth Grade Proficiency, Southeastern Arizona	152
Chart 102: Educational Attainment, Southeastern Arizona	153
Chart 103: Productivity, Southeastern Arizona	154
Chart 104: Poverty Rate, Southeastern Arizona	154
Chart 105: Infant Mortality Rate, Southeastern Arizona	155
Chart 106: FBI Crime Index, Southeastern Arizona	156

List of Tables:**Page:**

Table 1: Employment and GSP, % share of total	7
Table 2: Characteristics of Arizona's Basic Industries	8
Table 3: High school completion rates for 18-24 year olds not currently enrolled in school,98-00, %.....	35
Table 4: Educational Attainment Indicators.....	38
Table 5: College Indicators	39
Table 6: Internet Connectivity	50
Table 7: Distribution of Irrigated Land.....	52
Table 8: Health Indicators	57
Table 9: Population By Poverty Status, 1999 and 1989	59
Table 10: Crime and Human Welfare Indicators	60
Table 11: Population Growth Rates By Decade	61
Table 12: Economic Opportunities	70
Table 13: Components of Economic Opportunities	72
Table 14: Economic Opportunities By Region	74
Table 15: Research Centers, Institutes and Programs at Arizona Universities	75
Table 16: Comparative Advantage Indicators.....	88
Table 17: The Impact of Comparative Advantage Measures on Regional Economic Growth	89
Table 18: Arizona Economic Forecast Scenarios 2002-2012, annualized growth rate, %	90
Table 19: Characteristics of MAG's Basic Industries	95
Table 20: Characteristics of PAG's Basic Industries.....	107
Table 21: Characteristics of NACOG's Basic Industries	117
Table 22: Characteristics of WACOG's Basic Industries.....	127
Table 23: Characteristics of CAAG's Basic Industries	139
Table 24: Characteristics of SEAGO's Basic Industries	148
Appendix: Diversity Index, Arizona Counties and Regions, 2000/2001	148

Arizona's Economic Future

Executive Summary

Arizona is beginning a new economic cycle as it emerges from the recession of 2001. The changing U.S. and global economic environment is shifting the competitive landscape so that Arizona's driving industries of the past may not be sufficient to maintain its economic wellbeing going forward.

Broad economic trends. The economy of the coming decade will be characterized by five broad factors. First, it will be driven by an accelerated pace of product development, requiring constant research and development. Second, the workforce will need to be increasingly well trained and productive to keep up with product cycles and to pull ahead of national and global competitors. Third, infrastructure such as telecommunications, electric utilities and surface transportation will need improvements to accommodate ever rising supply-chain management requirements. Fourth, labor and capital will need to be increasingly flexible and responsive to rapid changes in products and processes as the economy advances. Fifth, export markets will shift as Mexican industry moves up the value chain, free trade expands to South America, Asia captures more high-tech manufacturing and the dollar falls from recent highs.

Industrial structure. Arizona's current economic structure still includes the proverbial Five C's of cotton, cattle, citrus, copper and climate, but it now is augmented by electronics and other tech industries, aerospace and back-office administrative services that expand the employment and production base. Indeed, of the Five C's, only climate-related industries provide any dynamism to the economy today. Financial services, business services, and production of missiles and space equipment round out the industries providing dynamism and economic growth in recent years. Electronics, aircraft, federal government and agriculture have added stability to Arizona's economy over the past decade. Mining's role in the economy diminishes as the economy expands. Moreover, while Arizona's economy has created new jobs at a remarkable pace, its current structure has failed to keep per capita income equal to the national average or to significantly improve poverty rates.

Arizona's advantages. Arizona does have a number of advantages that will support the economy going forward. They include in-migration of a skilled workforce, business costs near average for the U.S. and below those of California, costs of living below most competing centers of technology, a proven presence of research and innovation, ample capacity at its major airport, high exposure to export trade, and extensive forest, farmland and scenic resources.

Arizona's challenges. However, Arizona ranks near the bottom for a number of critical measures of comparative advantage indicating a need for further investment and policy considerations in the years to come. Workforce quality is of particular concern. While Arizona is able to attract skilled workers from outside the state, the local workforce does not measure up. Arizona ranks last for the rate of high school completion and nearly last for the share of high school graduates continuing on to college. Eighth-grade proficiency test results are below average and vary widely across the state's regions. State per capita spending ranks nearly last for K-12 education and 41st for higher education.

Other measures also put Arizona in a poor light. Its vaunted quality of life is tarnished by a crime rate that consistently ranks among the top five. The quality and distribution of infrastructure is problematic. Many outlying areas are not well served by telecommunications and water systems. Highways face capacity constraints, and aging road surfaces on older highways are in need of rebuilding. Innovative businesses face a dearth of venture capital, which ranks last relative to the size of Arizona's economy when compared to competing tech-related states. Moreover, a tax structure weighted toward business taxes and away from personal taxes deters expanding firms from considering Arizona.

Outlook. Improving Arizona's measures of comparative advantage can make a difference, particularly with regard to per capita income growth. Five measures, including the tax burden, educational attainment, crime rate, SAT scores, and research and development show significant statistical relationships within Economy.com's state econometric forecasting system. To illustrate the impacts of these relationships, we assume that Arizona's ranking for these five measures of comparative advantage shift from their current average or below average levels to equal the current top-ranked state for each. This results in the model's projection for per capita personal income growth over the next ten years rising from a baseline forecast of 1.6% per year to a more rapid 3.4% annualized rate. Conversely, if they were to worsen to equal the bottom-ranked state for each measure, per capita income growth would slow to 0.5% per year. Projections of employment and output show similar results.

Economic opportunities. A number of economic opportunities to improve Arizona's economic competitiveness in the decades to come have been identified based upon three criteria. First are industry growth projections for the U.S. economy. Second are estimated relationships between historical regional industry growth trends and Arizona's measures of comparative advantage. Third, industries selected have qualities that conform to more than one of the fundamental assumptions of the changing U.S. and international economic environment—technology based; highly productive; research intensive; linked to export markets; and consistent with local resources and the state's diverse regional economies. These opportunities are as follows, ordered by a combined rank of the first two criteria—national outlook and local potential:

1. Computer software and systems integration
2. Healthcare and biotechnology
3. Industrial machinery
4. Telecommunications
5. High-tech optical, medical and measuring instruments
6. Forest products
7. Engineering services – research and testing
8. Transportation, warehousing and logistics
9. Agriculture/Food processing/ Agricultural technology
10. Defense/Aerospace/Avionics industries

Foundational issues. Aside from these specific opportunities for industrial and economic development, four specific issues relating to broader foundational issues of the state's economy and its regional distribution are identified. The first relates to tourism and quality of life. It is assumed that tourism will continue to be a driving force in Arizona's economy and so tourism, therefore, is not included in emerging opportunities. But aspects of tourism relating to museums and the cultural arts remain underrepresented in the state's economic structure. Their further development not only would enhance Arizona as a tourist destination, but would contribute to a quality of life of the highest standard that would help retain the skilled workforce that the state is able to attract. Second is financial services. There is a need to expand the availability and diversity of financial resources to support entrepreneurs, international trade, and direct investment in Arizona. This is especially evident to increase access to capital, in particular venture capital. Third is education and workforce quality. Perhaps the most resounding finding of this report is that numerous measures of education performance and outcomes are not only below average but also near the bottom of all states. Thus the continuing need to improve education and workforce training at all levels—K-12, community colleges, and the universities. Fourth is healthcare. While aggregate statistics of health are not bad in Arizona, they mask distributional issues of access and incidence of disease, limiting the long-term economic potential of the some of Arizona's more rural regions.

Arizona's Economic Future

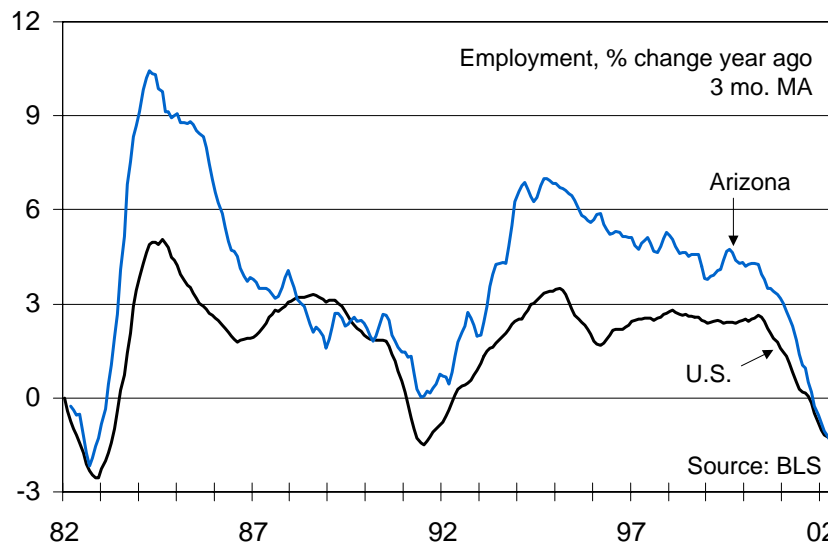
1. Arizona's Economy Today – End of a Cycle; Beginning Anew

1.1 Current Economic Trends

Labor Markets. Arizona's economy peaked in the spring of 2001 and was in recession at least through May 2002. Approximately 38,000 jobs were lost during this time and the unemployment rate has risen by about two percentage points, standing at 5.7%.

The current recession is quite different from the previous one in 1991-1992. Indeed, while the previous recession was barely felt in Arizona, the state has gone from leader to slightly underperforming over the course of just one year. Its current pace of employment decline of -1.4% on a year-to-year basis is very near the -1.2% rate nationwide, although the state's downturn is a deeper shift from peak growth rates exceeding 4% in mid-2000 versus a 2.5% peak nationwide (see Chart 1).

Chart 1: Employment Downturn Worse Than 1991 Recession



Arizona was hit hard by the recession as it is exposed to a number of industries that were subject to waning demand over the past two years. The state's technology-related economy led the state's recession as demand for semiconductors and other electronic equipment began to fall in early 2001. The situation was compounded by the events of 9/11 when nationwide travel and tourism industries suffered terribly (see Chart 2). Airline layoffs and flight cutbacks were sharp in Phoenix. Hotels, restaurants and resorts in Phoenix and Tucson were hit the hardest due to their greater dependence upon fly-in visitors. The rural areas that cater more to drive-in markets have remained remarkably stable. The downturn caused office vacancy rates in Phoenix and Tucson to nearly double over the past year. Thus, office and other nonresidential construction has also slowed dramatically.

Finally, labor market conditions are still weak, as indicated by an increase in the number of unemployment insurance claims by more than 35% over the year through April (see Chart 3). Claims nationwide are up by 10% over the year. Another indication of the severity of Arizona's recession is a rise in personal bankruptcy filings over the year through the first quarter of 2002 by 14%, versus a 3% rise nationwide.

Chart 2: Manufacturing and Tourism Led Downturn

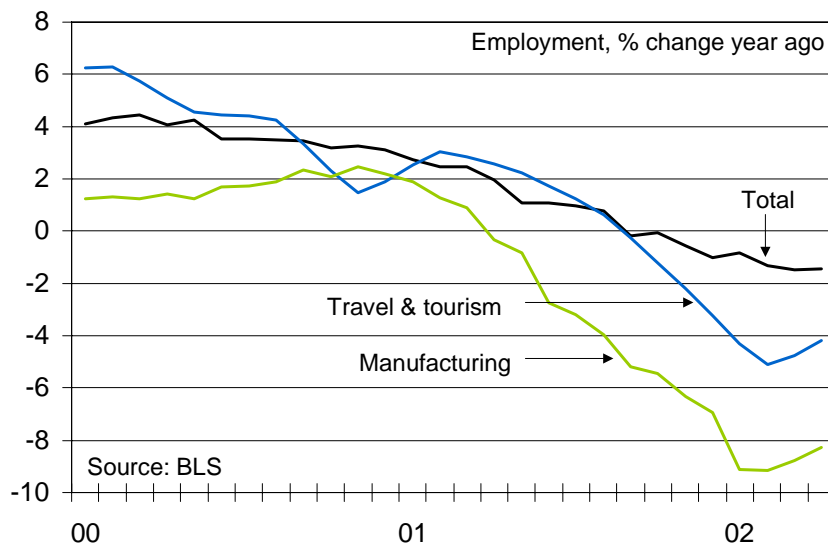
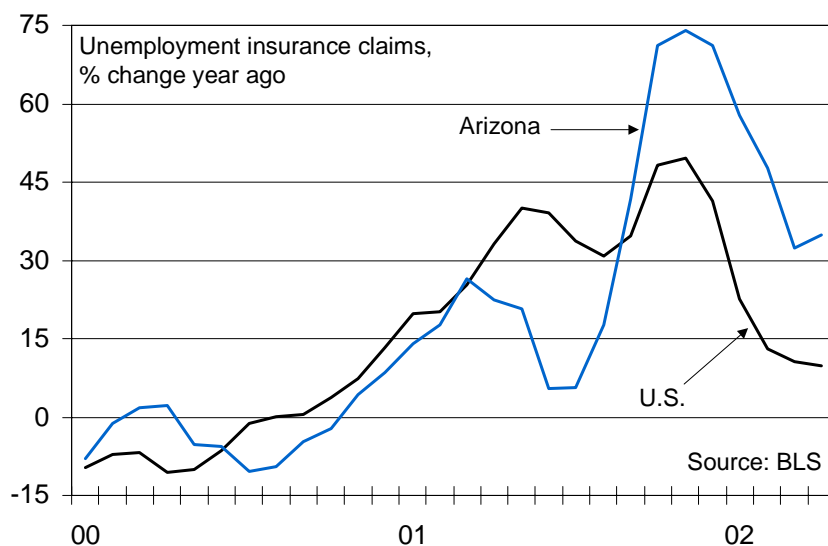


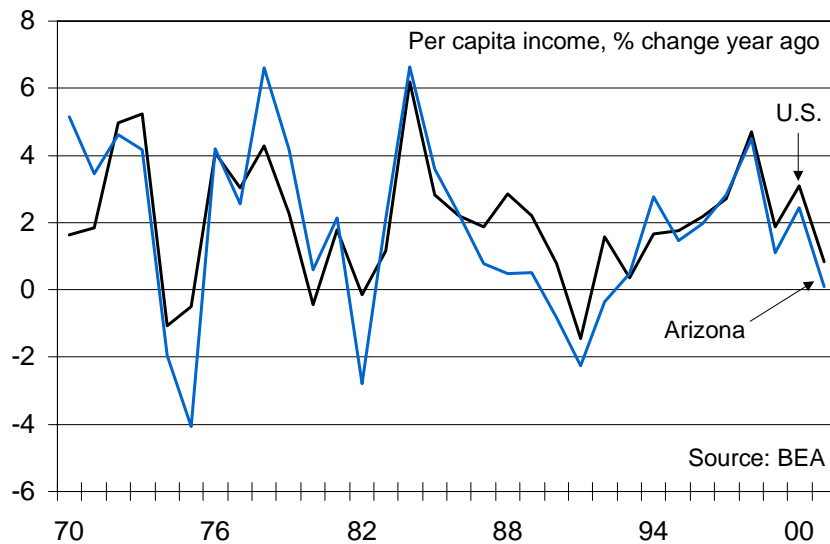
Chart 3: Arizona Labor Market Conditions Still Weak



There are some indications that the worst of the recession is over for Arizona and that the second half of 2002 will start the next business cycle for the state's economy. For example, while payroll employment continues to fall, the unemployment rate has improved slightly to 5.7% from a peak of 6.0% in February. Employment in financial services has remained steadier and retail trade employment continues to rise. Some stability has also returned to the large business service and transportation industries, although payrolls are still down over the year.

Income. The Arizona and U.S. economies both have an advantage at this point of the business cycle that they did not have during recessions over the previous three decades. That is, real per capita income has not fallen on a year-to-year basis, even if employment has. This likely is due to continued growth in labor productivity, which was a hallmark not only of the 1990s but also continuing through the 2001 recession up to today. Thus, consumer spending has held steadier, acting as a buoy for the broader economy in Arizona and nationwide. This pattern sharply contrasts with downturns in real per capita income in 1975, 1982 and 1991 (see Chart 4).

Chart 4: Income Growth Still Buoyant



A primary purpose of this paper is to prepare a vision of how the next business cycle may appear. While no one knows how long the next cycle will last, this paper takes a view over the remainder of this decade to provide insight into the major macro and international economic trends, and how Arizona's comparative advantages may contribute to its economic growth and development during this time.

1.2. Arizona's Economic Structure

Industrial Trends. The old adage of Arizona's Five C's—cotton, cattle, citrus, copper and climate—can't be discounted quite yet. They still appear in one form or another among the basic industries that support the expansion of the state's economy.¹ To this list, however, one must add electronics, aerospace and back-office administrative services, among others. Additionally, the Five C's must be further decomposed because growth trends in agriculture (cotton, cattle and citrus) and tourism and senior services (climate) are quite varied. Moreover, mining (copper), while it does generate income for the state, is not a growing industry over the long term. Some of the Five C's remain leading industries, but some are now lagging.

Economic Diversity. While Arizona's economy has grown over the decades and has broadened beyond the Five C's, it remains a narrowly focused economy with little diversity. According to Economy.com's index of industrial diversity, it ranks 40th among the states with an index value of 0.45 on a scale where 1.0 indicates a pattern of industrial diversity equal to the U.S.² Moreover, it ranks last among states considered as Arizona's competitors for the development or attraction of technology-based industries (see Chart 5).

¹ Basic industries are those that have a higher than average concentration in the local economy and either market their goods and services outside of the area or cater to those bringing income or wealth into the area, thus generating a stream of income into the local economy. For the purposes of this study, an industry with a location quotient greater than 1.05 is defined as a basic industry.

² Industrial diversity is defined as the extent to which a state's industrial structure approximates the base industrial structure. Diversity is derived using the following formula: $Diversity = 1 / \sum ((EMP_{ij} / EMP_{BASEj}) * EMP_{ij})$, where EMP = share of employment in three-digit SIC industry j during period 2000-2001; i = local area; BASE = Either Arizona or U.S. The Diversity Index is bounded between 0 and 1; a value of 1 means the region has the same industrial structure as the base region, while a value of 0 means the region has a totally different industrial structure. The formula is derived from the Hachman Index, Bureau of Business Research, University of Utah, 1994.

Chart 5: Little Diversity in Arizona's Economy

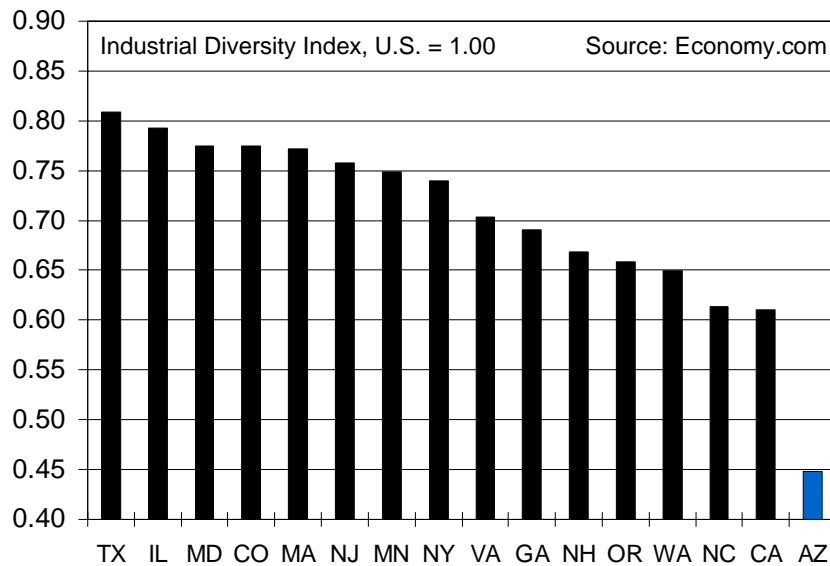
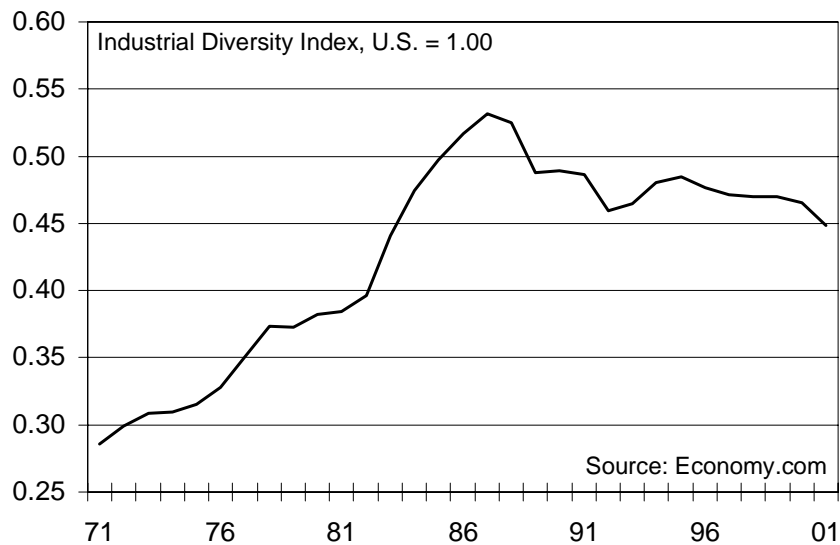


Chart 6: Arizona's Economic Diversity Not Improving



Not only is the state's diversity low, but it has not improved over the past 15 years relative to the U.S., despite very strong economic growth during much of this time (see Chart 6). It is important to remember that the diversity index is a relative measure that compares the distribution of economic activity to that of the U.S. Thus, while the economy certainly has diversified with the addition of technology-based and service-producing industries, the broad U.S. economy has diversified to an even greater extent. For example, construction's share of employment in Arizona at 7% remains about equal to its average share over the past 20 years and about two percentage points above the U.S. share. The risk going forward, therefore, is that the state economy may not be diversifying enough to take advantage of emerging trends during the remainder of this decade.

Table 1: Employment and GSP, % share of total

	Employment (2001)		Gross State Product (2000)	
	Arizona	U.S.	Arizona	U.S.
Mining	0.4	0.4	0.7	1.3
Construction	7.3	5.1	5.9	4.7
Manufacturing	9.3	13.4	15.6	15.8
Durable	78.3	60.1	84.0	57.6
Non-durable	21.7	39.9	16.0	42.4
Transportation & Utilities	4.9	5.4	7.1	8.3
Wholesale Trade	4.9	5.1	6.5	6.8
Retail Trade	18.6	17.8	10.5	9.0
Finance, Insurance & Real Estate	6.6	5.8	18.4	19.5
Services	31.3	31.1	22.2	21.8
Health Services	6.8	7.9	5.3	5.5
Government	16.6	15.9	11.6	11.6

Sources: BLS, BEA, Economy.com

Imbalances. General imbalances in the economic structure arise from an overabundance of construction, retail trade and government employment. Manufacturing plays a relatively small role in terms of employment, accounting for just over 9% of employment versus over 13% nationwide. Because manufacturing production is concentrated in just a few high-value industries, however, manufacturing's share of the value of total output—about 16% in Arizona in 2000—is about equal to the national share (see Table 1).

Government employment is high due to the large presence of federal lands and federal programs related to the Indian reservations in Arizona. The classification of some Indian tribe enterprises as government activity also biases upward the data for government employment or output. Thus, government will always have a rather high share of employment, which will keep Arizona's diversity index relatively low despite an expanding and diversifying economy. Nevertheless, its index of diversity has not risen in 15 years.

Leading and Lagging Industries. We combine results from the affiliated State Economic Base Study with research by Economy.com to characterize the role of Arizona's basic industries in supporting the economy's growth through the past business cycle (see Table 2). While by definition all basic industries support the local economy and contribute to its expansion through the stream of income that they generate, they do not all contribute to the area's dynamism by creating a changing and diversifying economy. Thus, the state's basic industries are divided into four groups: Dynamic industries, Growth industries, Stable industries and Deconcentrating industries.³

The traditional Five C's of Arizona's economy are distributed across these four different characteristics. Copper (represented by the mining industry) is a deconcentrating industry. By measure of employment, wages or output, the industry has contracted since the mid-1990s. If employment is the measure, the industry has fallen from a peak payroll that was seen back in the mid-1970s. The industry has been volatile as the price of copper rises and falls, but its significance to the economy is decreasing.

The three agricultural C's of the economy are characterized as stable or deconcentrating. Farm labor and management services are stable components of the basic economy. Indeed, real gross product of farms in Arizona rose by an average annual rate of 3.2% during the

³ Dynamic industries have had employment growth exceeding an 8% annualized rate between 1991 and 2001 and a location quotient that has risen by more than 3%. Growth industries have had employment growth exceeding 6% and a location quotient that has risen by more than 1%. Stable industries have had employment growth of less than 6% annualized and a stable location quotient. Deconcentrating industries have employment growth less than 6% annualized and a declining location quotient.

Table 2: Characteristics of Arizona's Basic Industries

Dynamic Industries

- Mining and manufacturing of construction materials
- Amusement and recreation services
- Transportation services
- Management and public relations services
- Medical service and health insurance carriers

Growth Industries

- Missiles and space vehicles manufacturing
- Banking, depository institutions
- Business services, including call centers and temporary help

Stable Industries

- Air transportation
- Electronic components and accessories manufacturing
- Aircraft and parts manufacturing
- Restaurants
- Real estate and insurance agents
- Federal government
- Farm labor and management services

Deconcentrating Industries

- Hotels and lodging
- Crop and soil preparation services
- Metal mining

thirteen years of available data ending in 2000 according to the Bureau of Economic Analysis, versus 2.6% nationwide. Moreover using a location quotient based upon output for farms and food processing, the concentration of agriculture in Arizona has remained stable in recent years. Thus, despite the fact that crop and soil management services are characterized as declining, agriculture as a whole may be considered a stable basic industry in Arizona.

The impact of the fifth C in Arizona's economy, climate, is evident in a number of the state's basic industries. First through a variety of components of the tourism industry, for which climate, of course, is critical. Amusement and recreation services and transport services are dynamic industries. Air transportation and restaurants are stable industries. It is important to note, however, that at least through the course of the past business cycle between 1991 and 2001 the hotel industry is classified as a deconcentrating industry. Employment in the industry did grow rapidly through 1997, but then remained largely unchanged while it compensated in 1998 through 2000 for previous overbuilding. The industry's employment began to fall in early 2001 at the onset of the recession, and then plummeted following the downturn in travel following 9/11. Thus, the industry is still largely overbuilt, at least among Class A properties in Phoenix and Tucson, and it will take some time before it expands once again.

Climate is also a determinant in industries identified in the Economic Base Study as "Growth Industries", i.e. industries that are expanding simply because of the rapid speed of the state's economic growth. And much of this growth can be tied to the climate's attractiveness for migrants from other states. Dynamic industries such as the production of construction materials and, to a certain extent management and public relations, are directly related to expansion of the economy due to migration.⁴ Similarly, banking services and real estate and insurance agents can be traced directly to demand by the expanding population.

⁴ The industry termed mining and production of construction materials is a combination of the mining of production stone and the production of millwork, plywood and structural members, wood buildings and mobile homes, and cut stone and stone products.

Arizona's economy, however, is now much more than the Five C's. Technology now plays a critical role in the economy's dynamism. Among its basic industries, one of the state's growth industries and two of its stable industries are technology related. Employment in the manufacture of missiles and space vehicles is a growth industry that has expanded steadily since 1994. Also, temporary help services are used widely by technology industries to keep the workforce flexible enough to adjust to their frequently volatile cycles of production. Over 40% of employment in business services is accounted for by personnel supply firms, i.e. temporary help. Thus, temporary help services are a critical component of Arizona's tech-based industries and are a part of its growth structure.

Electronics, aircraft, and aircraft parts manufacturing are among the largest of Arizona's basic industries. Over the course of the past business cycle, components of these industries, including semiconductors, aircraft parts and avionics grew rapidly through 1998. Payroll growth in electronics halted in 1999 and 2000, however, and had an outright decline in 2001. Similarly, the aircraft industry also peaked in 1998, but fell in each of the subsequent years due to consolidation within the industry and the sluggishness of defense spending at home and abroad. These industries maintained their relative concentration in Arizona, however, as their downturns in recent years reflected national and international demand conditions rather than any loss of comparative advantage in Arizona. Indeed, other centers of aircraft manufacturing such as Seattle, St. Louis and Wichita saw steeper declines in the industry's employment than seen in Arizona.

There is no industry directly called back-office services. Yet the importance of this activity can be seen from the presence of medical service and health insurance carriers among the dynamic industries, and banking and business services among the growth industries. Banking is here despite the relative lack of a major banking headquarters in the state. Similarly, medical service and health insurance carriers as a dynamic industry, without a major headquarters in the state, is a further indicator of the presence of back-office operations in Arizona.

Two remaining industries are among the state's basic industries. First is the federal government, which contributes to the economy through its ownership of vast tracts of land through the National Park Service, U.S. Forest Service, Bureau of Land Management, and the broad programs of the Bureau of Indian Affairs. Federal payrolls and federal procurements represent income and expenditure flows that come to Arizona from outside sources, in this case from federal tax receipts generated largely outside of Arizona. Second, transport services are linked to travel and tourism as well as to manufacturing through the arrangement of passenger and other miscellaneous transport services.

To summarize, the factors that drive Arizona's economy have indeed diversified away from the Five C's with technology-based industries and business and back-office services. Yet the economy still depends to a great extent on tourism-related industries, real estate and construction, agriculture and government. And indeed, there are real advantages in terms of area's natural endowments that will continue to support these industries going forward. But there may be limits to the pace of growth in these traditional industries, and dependence upon other drivers such as electronics manufacturing leaves the economy vulnerable to industry restructuring and migration overseas. Thus there is a need to search for possible paths of further diversification and economic growth.

2. The Broader View

This section focuses on assumptions that will shape the pace and structure of the U.S. macro and international economies in the years ahead. These assumptions will have significant impacts upon the outlook for Arizona's economy and upon appropriate policy directions that may help to support the economy, to continue to attract investment, and to maintain the state's competitiveness in the national and global economic environment.

2.1 The U.S. Macroeconomic Outlook

The U.S. macroeconomic outlook over the next decade is bright, characterized by generally strong growth, low unemployment and low inflation. Real GDP growth is expected to average between 3% and 3.5% per annum, the unemployment rate will average near 5.5% and consumer price inflation will average near 2.5%. Measures of household living standards will also improve, including continued increases in the homeownership rate, real household incomes and net worth.

While the economy is likely to experience a recession sometime in the next decade, the nation's business cycle is becoming increasingly less volatile. The next downturn will likely be as modest and short-lived as the just-ended recession.

The economy's performance in the next decade will not measure up to the boom-like conditions that prevailed during the second half of the 1990s, however. That period was boosted by extraordinarily optimistic expectations that in hindsight were clearly overdone.

The economy also faces significant longer-term risks, ranging from the possibility of further terrorist attacks, significant disruptions to energy supplies, and mounting government fiscal problems that will only be exacerbated when the large baby-boom generation begins to retire later this decade.

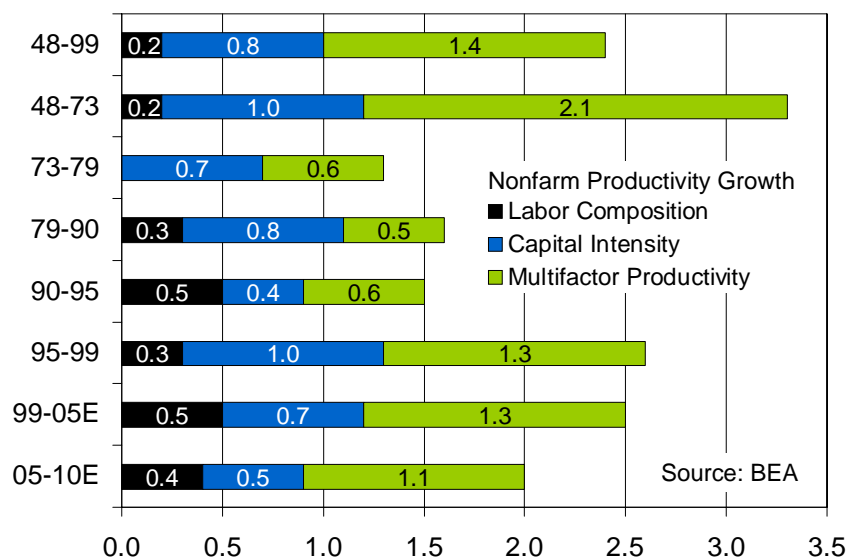
Most fundamentally, the economy's long-term performance is determined by the growth in underlying productivity and changes in the labor force. Both are considered in the discussion that follows.

Productivity Growth. The acceleration in the economy's potential growth since the mid-1990s is the result of stronger growth in underlying productivity. To understand how underlying productivity growth has accelerated and why this growth will be maintained, consider that it is ultimately driven by three factors, including the composition of the labor force, capital intensity, and multifactor productivity growth.

A more educated and skilled worked force is clearly more productive than one that is not. The quality of the workforce also changes over time given demographic trends and the returns to education. Capital intensity refers to the amount and quality of the capital—equipment and structures—that labor has to work with. Labor that works with more sophisticated computers and offices with good Internet connections, for example, will be more productive. Multifactor productivity is effectively a catch all, and includes anything that is not accounted for by changes in labor composition and capital intensity. It is generally believed that technological change is one of the primary contributors to MFP. If technology is advancing more quickly or is being implemented more effectively, then MFP will accelerate.

In the more than half a century since World War II, productivity growth has averaged 2.4% per annum. According to the BLS, 20 basis points of that growth is attributable to the improving composition of the labor force, 80 basis points is the

Chart 7: Decomposing Productivity Gains



result of growing capital intensity and the remaining 140 basis points is due to growth in MFP (see Chart 7).

Improvements in the quality of the workforce have become an increasingly important source of productivity gains. In the years following WW II the workforce was becoming more educated, but due to a surge of new workers including women and baby boomers, the workforce was very inexperienced. Twenty year olds, with little if any work experience, surged as a share of the working age population in the 1960s and 70s, peaking at close to one-third of workers by the early 1980s. Experienced 50 year olds also declined as a share of the working age population throughout this period. The quality of the labor force has been steadily improving since then. One-third of the productivity gains during the 1990s was due to an increasingly more educated and experienced workforce. College graduates are now one-fourth of the population over the age of 25.

The quality of the workforce will continue to improve and add at least as much to productivity gains during the next decade as it has during the past decade. The boomers are now aging into their most experienced, educated and thus productive working years. There will be more 50 year olds than 20 year olds a decade from now.

With the explosion in business investment in computer and telecommunication technologies, it is surprising that the BLS found that increasing capital intensity contributed less to productivity gains during the 1990s than any other time since WW II. One-third of the productivity growth experienced during the decade was due to an expanding stock of capital. In the 1970s and 80s, in contrast, increasing capital intensity was responsible for two-thirds of the growth in productivity. This can be partly explained by businesses aggressively purchasing increasingly shorter-lived computer related equipment. Given higher depreciation rates, businesses must invest even more just to maintain their net capital stock. There has also been less spending on long-lived structures, such as office buildings and warehouse space, during the past decade.

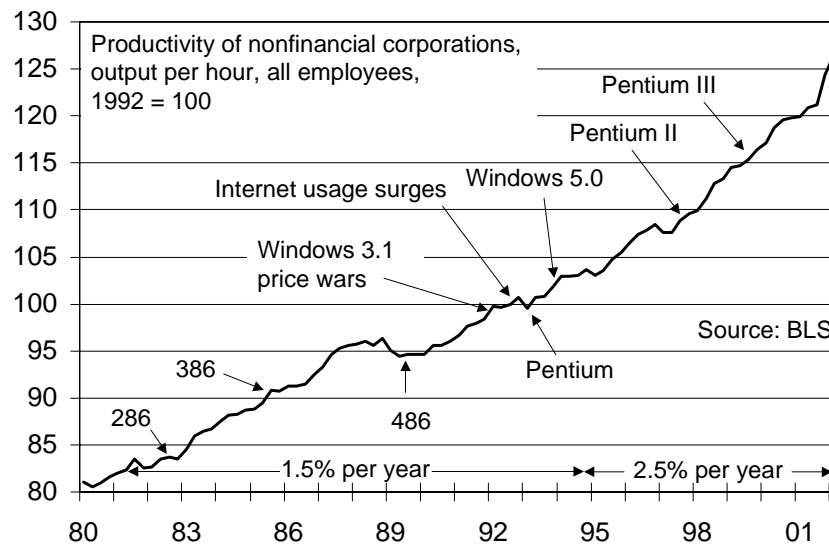
Increasing capital intensity should at worst be able to contribute as much to productivity gains in this decade as it did in the previous decade. There is every indication that businesses will continue to invest aggressively in both equipment and

structures. Depreciation rates should also stabilize in coming years as businesses complete their most significant computer purchases.

The most significant difference between the stronger productivity growth of the first quarter century after WW II and the past quarter century is a dramatic shift in the growth in multifactor productivity. Between 1948 and 1973, MFP grew at now what seems like a whopping 2.1% per annum. Since 1973, per annum MFP has grown by substantially less than half that. This startling drop off in MFP growth is the subject of considerable debate. Possible partial explanations include the oil price shock of that period, which made much of the nation's energy-intensive capital stock obsolete, and a slowing in the pace of technological change.

The economy is in the midst of an apparent acceleration in the pace of technological change. This is most evident in advances made in semiconductor technology. Intel formally introduced the 286 chip, which had an initial clock speed of 6MHz, in early 1982 (see Chart 8). The power of succeeding generations of chips, which have been introduced nearly every three years, has grown quickly. There have also been significant advances in the sophistication of computer software. Microsoft introduced Windows 3.1 in 1992, Windows NT and 95 in 1995, Windows 2000 around Y2K, and Windows XP most recently, all of which has heightened the

Chart 8: Accelerated Pace of Technological Change



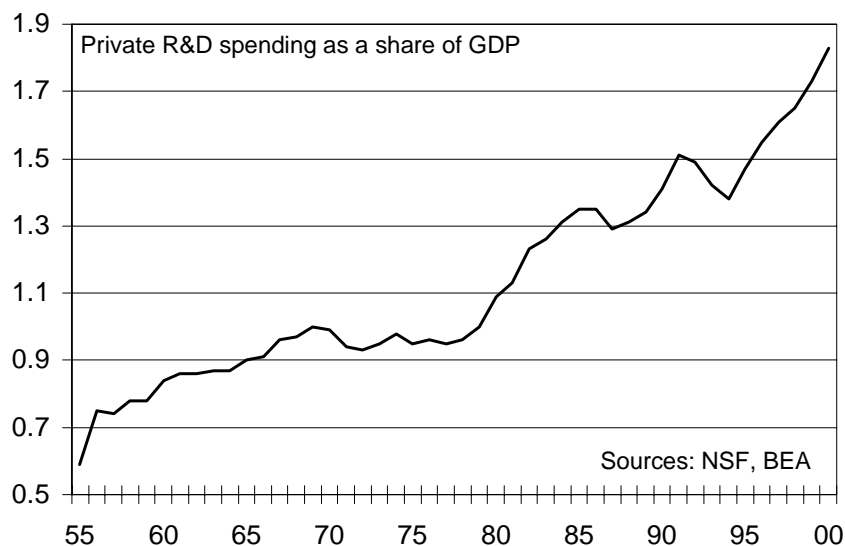
acceptance and effectiveness of PC technology. There is no indication that the pace of technological change is slowing.

While many factors have likely contributed to the heightened pace of technological change, stronger business R&D spending has been instrumental. This is particularly true since the mid-1970s (see Chart 9). The currently strong R&D spending also augurs well for the future pace of technological change and thus productivity growth.

Over the next decade, underlying productivity growth is expected to average between 2.0% and 2.5% per annum (see Chart 7). Approximately one fourth of the growth will be due to improving labor composition, another one fourth of the growth will result from rising capital intensity, and MFP growth will account for the remaining one-half of the growth.

Although necessary, projecting productivity growth is a particularly intrepid endeavor. Not only is it based on expectations for future technological progress, it is based on a view of how quickly and effectively new and existing technologies are

Chart 9: R&D Spending Moves Higher



implemented. There are numerous historical examples of technologies that moved only slowly from invention to widespread economic use. The steam engine was invented in the 18th century as a way to pump water out of mines. It remained simply that for many years, only becoming a source of power for industry, transport and ultimately electricity decades later. The laser is a 20th century example of a technology whose import was completely misjudged, at least initially. Invented at Bell Labs, laser technologies are now a vital part of the telecommunications industry, in addition to a wide range of other applications from measurement to navigation and surgery. Lawyers at Bell Labs were initially unwilling, however, to even apply for a patent on the laser, thinking it had no possible relevance to the telephone industry.

It is increasingly apparent that not only has the pace of technological change accelerated in recent years, but that the diffusion of technology is more rapid and it is being implemented more effectively. Synergies are developing across technologies as seemingly different as the microprocessor, the laser, fiber optics and satellites. Nowhere are these synergies more apparent than on the Internet.

The acceptance of the technologies embodied in the Internet has been unprecedented. As of the end of 2000, nearly one-half of all households were connected to the Web. Only five years after households and businesses were able to access the Web, there were some 50 million users (see Chart 10). It took the cable TV industry a decade to reach 50 million customers from its inception in the early 1980s, 13 years for TV to reach that landmark, and 38 years for radio.

The effective economic use of the Internet has also been unprecedented. The web is reducing transaction costs between businesses and between businesses and consumers, allowing for the rapid dissemination of more and better information and lowering entry barriers into numerous industries (see Chart 11). A recent Microsoft study on the mortgage origination process provides a telling example. The conversion of the origination process to a full-service, Web-based electronic channel is estimated to reduce closing costs, which currently are close to 3-percentage points, by two-thirds. The cost savings result from efficiencies ranging from easier access to data on the borrower to more rapid securitization of the loans. Information to the lender and borrower is much enhanced. Lenders can quickly gather credit and employment histories on borrowers, while borrowers gain access to information on the plethora of mortgage loans that are available. Entry barriers into the mortgage

Chart 10: Internet Diffuses Rapidly

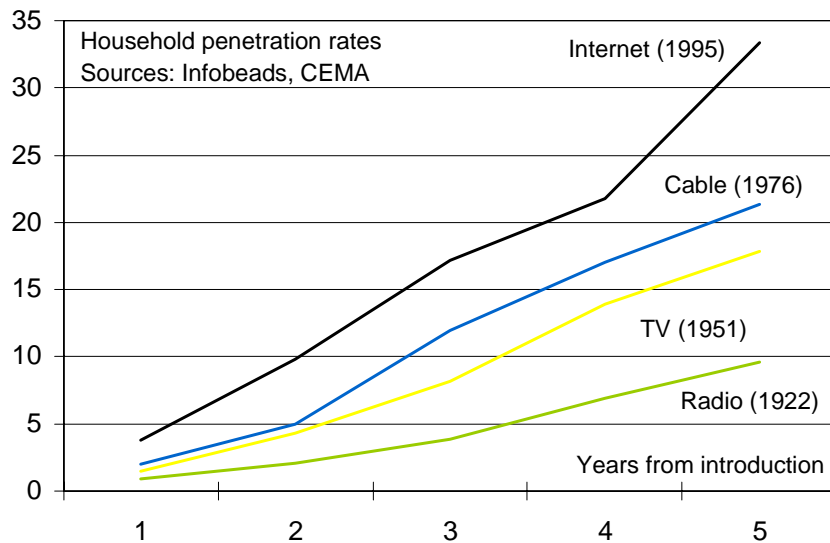
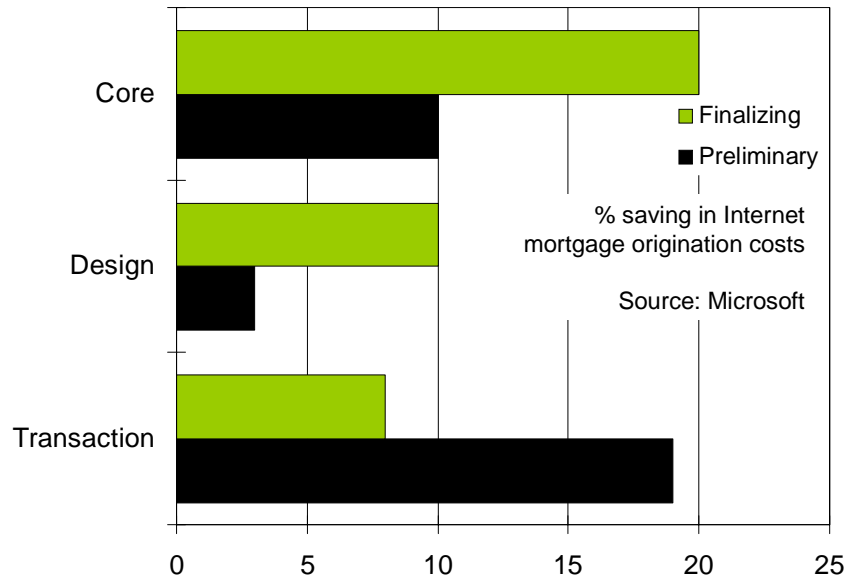


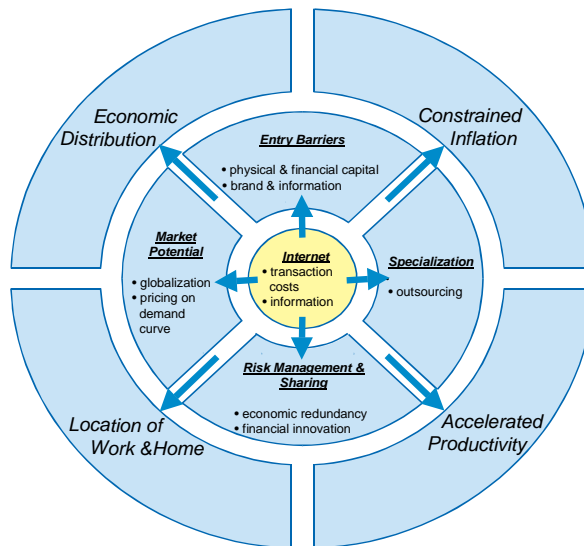
Chart 11: Percent Saving in Internet Mortgage Origination Costs



lending business also decline as lenders no longer need to have a branch or loan origination office, just a web site.

The lower transaction costs and entry barriers and enhanced information that the Web affords have substantial economic ramifications. Most importantly, competitive pressures rise and businesses are induced to specialize (see Chart 12). Heightened competition is a direct result of lower entry barriers and enhanced information. Business specialization will also occur as transaction costs across various business activities decline. The typical business today conducts a wide range of activities, including everything from the actual production of a good or service, to its distribution and marketing, and all the associated financial, accounting, legal and human resource functions. Historically, the cost of doing these activities within the firm was lower than the cost of contracting for these activities outside the firm. The dramatic reduction in transaction costs afforded by the Web changes all that.

Chart 12: Internet Economics



Businesses will increasingly concentrate on their very specific comparative advantage, and leave all else to other firms with their own comparative advantages. This to some degree is already happening, as businesses have been aggressively outsourcing an increasing number of their activities. The Web will accelerate this process.

The greater competition and specialization proffered by the Internet directly results in enhanced productivity growth and, at least in the near-term, constrained inflation. While the benefits accruing from the Web are implicit in the previous analysis and productivity projections, any estimates are highly uncertain and variable. The Internet is altering the manner in which the economy operates in ways that were not readily foreseeable even just a few months ago. This is of course at the heart of the debate over the economy's recent performance and the appropriate conduct of economic policy.

Labor Force Growth. The economy's potential rate of growth over the next quarter century will be constrained, however, by an anticipated slowing in the growth in the labor force. Labor force growth is determined by the growth in the working age population and changes in the labor force participation rate.

Growth in the labor force has been slowing since the 1970s when it peaked at 2.7% per annum, slowing to 1.7% in the 1980s and 1.2% in the 1990s. Behind this slowdown has been both slower working age population growth and much smaller gains in labor force participation. The labor force is expected to expand even more slowly in the coming decade, decelerating to growth of 1% per annum, as the large baby boom generation begins to retire.

Expectations that participation rates will rise only marginally from current levels is due in part to much smaller further anticipated gains in female participation. The steady increase in female participation rates experienced during the 1970s and 1980s slowed substantially during the 1990s. It was inevitable that the growth in female participation would eventually slow. The participation rate for females between the ages of 35 and 44, for example, rose from one half in the late 1960s to 77% currently. The growth in female participation has also slowed as a result of the improvement in housing affordability in recent years. Strongly rising home prices and mortgage interest rates locked an increasing number of households out of homeownership during the 1970s and 1980s. At its low point in the early 1980s, the household earning the median income could afford to purchase only 60% of the median priced

home at prevailing interest rates, according to the National Association of Realtors. For families to afford to purchase a home, two-incomes were required and the female participation rates rose quickly. Since the late 1980s, weaker house-price growth and falling mortgage rates led to a dramatic rise in affordability. Affordability is currently near levels last seen in the early 1970s, and given the prospects for continued high housing affordability, female participation rates are not expected to rise significantly.

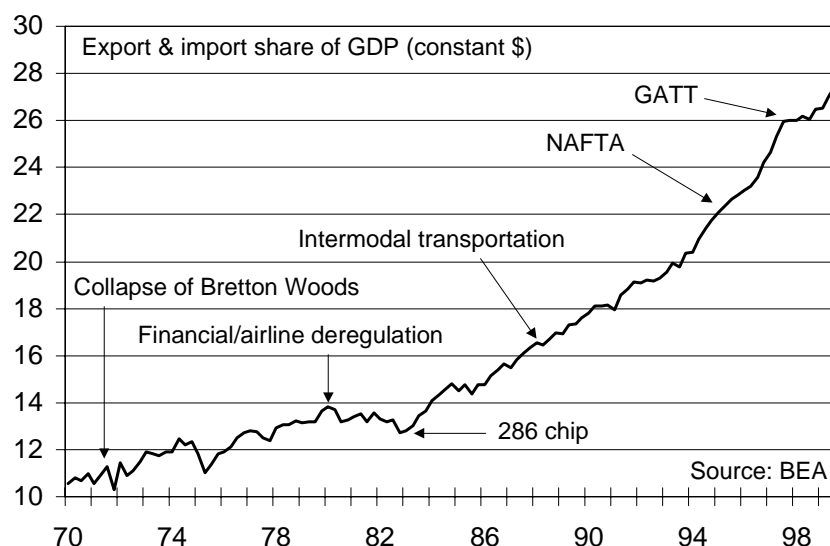
Participation rates are also no longer rising in part due to a shift in employer hiring practices. Employers are increasingly requiring their existing labor force to work longer hours rather than hire new employees to meet increasing demand for their goods and services. The relatively high fixed costs of hiring labor, including health, unemployment, and workers compensation costs, have been an important impetus in this change in hiring practices across many sectors of the economy, and is unlikely to change.

Business Cycle. Despite last year's recession, there is strong evidence to suggest that business cycles have and will increasingly become less pronounced. Prior to World War II the average expansion lasted only 25 months and the average recession at 22 months lasted nearly as long. In the past quarter century, expansions have averaged well over five years and recessions less than one year. The expansion of the 1990s was the longest in the nation's economic history.

The increasing longevity of economic expansions and shortening of recessions is the result of a number of long-running structural changes shaping the U.S. economy and the dynamics of the business cycle. These include the increased globalization of the economy, financial deregulation and innovation, a more flexible workforce and the heightened pace of technological change. These changes are impeding the development of those economic imbalances that often precede recessions and heightened the ability of the economy to adjust to those shocks that ultimately induce recessions.

Increased globalization of the U.S. economy through greater trade, direct investment and foreign immigration has dampened the business cycle. Exports and imports of goods and services currently account for nearly 30% of GDP, up from 20% at the start of the 1990s and 10% at the start of the 1970s (see Chart 13). Trade law liberalization and international financial deregulation from the collapse of the Bretton Woods fixed exchange rate agreement in the early 1970s to the recent passage of the NAFTA and GATT agreements have contributed to the globalization of the economy.

Chart 13: An Increasingly Global Economy



Improvements in transportation, distribution and communication technology and infrastructure have also stimulated trade.

U.S. recessions during the past quarter century would have been substantially more severe if international trade were not as important to the economy. In the nadir of the 1973-75, 1980 and 1990-1991 recessions, for example, year-over-year real GDP growth would have declined by as much as 1% more if it were not for an improving trade balance during those downturns.

Trade flows have also served to rein in the economy during the boom periods of expansions, forestalling wage and price pressures and thus subsequent downturns. Trade flows generally move counter cyclically since U.S. and world economies are oftentimes at different stages in their business cycles. In the U.S. recession year of 1991, for example, the Mexican and Japanese economies expanded by over 3% and the German economy grew by more than 5%. In contrast, when the U.S. economy was surging in 1994, the Japanese economy hardly grew and the German economy was decelerating quickly.

Globalization does pose a risk to the U.S. business cycle, however, by further exposing the economy to external exogenous shocks. The 1995 Mexican peso collapse and subsequent economic crisis, for example, was a factor in the slowing of the U.S. economy. Although by itself the Mexican crisis was not sufficient to undermine the U.S. expansion, if combined with a similar crisis in Asia, for example, a U.S. recession might have occurred.

Financial deregulation and innovation are also dampening the business cycle by lifting constraints on credit availability to households and businesses. This is most clearly seen in the housing and mortgage markets. Prior to the commencement of banking deregulation in the 1970s, short-term housing demand was largely determined by the availability of mortgage credit. Mortgage credit availability was in turn determined by the availability of deposits at thrift and, to a less extent, banking institutions. Deposit flows were highly volatile, however, since deposit rates were fixed by Regulation Q. When the Federal Reserve tightened monetary policy there were substantial deposit outflows from thrifts and banks as investors moved their savings to higher-yielding money market instruments. During this period of disintermediation the mortgage and housing markets shut down, significantly exacerbating an economic slowdown.

Policymakers recognized the disruption to the economy resulting from swings in mortgage credit availability and phased-out Regulation Q by the early 1980's. Policymakers also facilitated credit availability with the expansion of the secondary mortgage market through the establishment and support of Ginnie Mae, Fannie Mae and Freddie Mac. Single-family mortgages owned and insured through mortgage pools by these federally sponsored institutions now account for approximately two-thirds of all outstanding mortgages. Mortgages are owned by investors worldwide, ensuring that mortgage credit is always available to homebuyers at a price.

Financial innovation and deregulation have also mitigated credit constraints in commercial real estate markets. The rapid securitization of commercial real estate debt in the 1990s has more closely tied conditions in real estate markets to world capital markets. According to the Federal Reserve Board, nearly one-fifth of nonfarm commercial real estate and multifamily mortgages are owned by REITs, asset-backed security issuers and federally sponsored mortgage pools. This is up from less than 4% at the start of the 1990's and 2% a decade ago.

The increasing dependence of commercial real estate on world capital markets may also impose a discipline on real estate development. Investors evaluating real estate market securities in competition with other financial securities will quickly lose their

appetite for real estate securities if underlying market conditions turn soft. Capital will be reinvested in other financial assets raising the cost of capital for real estate development. This may make it more difficult for the substantial overbuilding to develop that oftentimes plagues real estate markets, resulting in real estate market and business cycle downturns.

The consumer loan market is increasingly less subject to credit constraints due to financial innovation and deregulation. Capital is plentiful for all types of consumer loans ranging from auto and credit card loans to home equity loans. This is largely due to the surging growth of the asset backed securities market, which has expanded to over \$1 trillion since its inception in the early 1980s. Although credit has long been available to so-called A-quality consumer borrowers with relatively good credit and employment histories, most of the growth in consumer lending in recent years has been to poorer B and C-quality consumer borrowers. Until recent times these borrowers were credit-constrained, foregoing spending during soft economic periods when incomes were weak but unleashing their pent-up demand when the economy rebounded. This resulted in substantial volatility in consumer spending. With more ample credit currently available, consumer spending and the business cycle are more stable.

The provision of greater credit to consumers through loans and leases has resulted in rising household debt service burdens, personal bankruptcy filings and credit losses for lenders, however. Although lenders have tightened loan standards in response to the deterioration in credit quality, competition in the consumer loan market remains high and may prompt lenders to take on added risk once credit conditions stabilize. Consumer leverage is an economic imbalance that oftentimes prevails prior to a recession. Unlike past recessions in which consumers reduced their debt service burdens, they continued to take on debt through the 2001 recession. Thus, the consumer debt service burden remains a problem and is a significant risk to the current economic recovery.

Greater flexibility in the nation's labor markets is also dampening the business cycle. Labor market flexibility has been enhanced by the growth in the contingent workforce. Contingent workers include independent contractors, those who work for temporary help agencies and contract firms and the self-employed. The growth in temporary help employment over the past quarter century has been extraordinary. The share of total employment in such jobs is near 2.0%, from essentially nothing a quarter century ago.

Contingent workers can quickly be deployed to industries where demand for their services is strongest from industries where demand is weaker. The costs of shifting contingent workers to jobs where and when they are needed are relatively low since most do not receive severance or other benefits. Labor markets have also become more flexible as employees are increasingly willing to shift the number of hours they work to meet changing demand for the goods and services they produce. Labor market flexibility is also manifested in the willingness and ability of labor to relocate.

The increased flexibility of the workforce has come at a cost to some workers in the form of constrained compensation, underemployment and the economic and other costs of moving, but it has enhanced the economy's ability to adjust to shifting conditions that could ultimately result in recession.

The business cycle is also being tempered by the heightened pace of technological change. Technological advances, for example, have reduced the role of inventory shifts in shaping the business cycle by reducing the amount of inventories that businesses hold relative to sales. This has occurred through the adoption of inventory management techniques such as just in time and materials resource planning, which

have been made possible by advances and strong investment in computer, scanner and telecommunications technology.

9/11. The economy's longer-term prospects will be impacted from the economic fallout of 9/11. At the very least, global outlays on the military and on maintaining personal and business safety will be more substantial in the years ahead. This spending does nothing to raise productivity gains and thus living standards. Indeed, the collapse of the Soviet Bloc in the mid and late 1980s and the subsequent decline in military outlays provided a substantial boost to the U.S. economy during the past decade. Perhaps the costs of combating global terrorism will be more evenly distributed across global economies than was the military spending associated with combating Communism, but perhaps not. The government surpluses projected for the beginning of the decade will not materialize for several years to come as additional military outlays and public spending will deplete reserve funds.

The terrorist acts may also undermine recent efforts to open the U.S. economy more fully to foreign immigration. An early agreement between the U.S. and Mexico to allow for a more open immigration policy seems unlikely now. Stronger immigration to the U.S. will be necessary for the U.S. economy to continue to grow strongly and to support the large number of us who will become retirees and rely on Social Security and Medicare in the decades ahead.

The most significant casualty of the terrorist actions, however, will likely be the personal privacy of all Americans. It may be necessary for the government to keep closer tabs on all of us to maintain the safety we will all demand. This may very well have serious deleterious implications for the free flow of ideas and creativity so essential to the entrepreneurship and productivity of the U.S. economy.

2.2 Business Practices

Emerging from the assumptions outlined above are a number of business practices that will shape the direction and pace of the economy going forward. Such practices include product development, labor force requirements, supply chain management, labor outsourcing and financing.

Product Development. The accelerating pace of technological change will drive industry to be increasingly research intensive and will generate increasingly short product cycles. This has two consequences for a local economy. First, for any industry to become or remain dynamic, it must have access to R&D capacity and the financing to support it. R&D can take shape in-house within a large organization that takes advantage of internal resources. It can operate as a public-private partnership such as through university R&D facilities or other public investments. Or it can take place independently, supported by venture capital.

Shorter product cycles caused by accelerating technological change cause manufacturing plants to become obsolete more quickly than in the past. This will happen either because the product manufactured becomes obsolete, or because the product becomes a mass-produced commodity more quickly, causing its manufacture to be shifted to a lower cost location. So while product manufacturing will be an increasingly volatile activity in terms of capacity and location, R&D will remain more of a constant. Thus, long-term economic growth will be better supported by manufacturing and services if it is accompanied by a significant research and development component.

Labor Force Needs. Employers will search for the most talented workforce available to support the R&D work necessary to keep up with accelerating product cycles and global competition. They will do this either by locating only where there is

an ample and well-trained workforce, by importing skilled labor, or by linking to global sources of skilled labor. The growth of Silicon Valley is an example of the first instance, in which local universities produce skilled workers and entrepreneurs producing new products and services. Less visible but equally important has been the use of community colleges in the Southeast and elsewhere to improve workforce quality in order to attract investment. Much of the Mountain West is an example of the second instance, in which migration flows of well-trained workers have boosted the quality of the workforce. The software industry is an example of the third instance when it taps into skilled labor pools globally to maintain 24-hour product development efforts. The assumption of slower labor force growth in the U.S. in the coming decade means that the domestic workforce will have to become increasingly productive in order to compete with the increasing ability to tap into foreign sources of skilled labor. Thus, it is not only traditional labor-intensive industries that will face global competition, but increasingly so with technology-related industries as well.

Labor Outsourcing. This will lead either to increased flexibility of in-house workforces, or more likely, the expanding use of a contingent workforce made of part-time workers, temporary workers, independent contractors and the self-employed. Thus, as with the need to support supply-chain management through improved telecom, labor outsourcing will increasingly require the use of off-site labor linked through telecommunications to a central site, and an ample pool of skilled workers willing to work flexible hours on diverse tasks.

Supply-chain management. This is more than just-in-time inventory management. This means a more technology-intensive application of telecommunications and software for transportation, warehousing and manufacturing. This means that quality of transportation links will be critical to avoiding delays. It means substantial investment in telecom and electric utility infrastructure to ensure adequate and consistent support of supply-chain management no matter the location. Finally it means that the labor force will have to be increasingly flexible to change shifts and responsibilities to adapt to rapid changes in supply-demand relationships.

Financing. The increasingly flexible economy will require flexible sources of financing that can respond immediately to research, development, and production needs. Venture capital and other sources of development capital proved their worth during the 1990s. But the eventual failure of many VC supported enterprises makes it clear that such funding will be undertaken only with much more due diligence in the future. Thus, budding entrepreneurs will need to develop partnerships in finance and business management to effectively take advantage of such resources.

But even more important, sources of financing will have to locate close to operations in order to respond effectively to the flexible financial needs of business. This pertains not only to the more speculative nature of start-up firms, but to the increasingly flexible production and R&D activities at existing firms. A local and engaged financial services industry, made up of a broad range of traditional and less traditional financial service firms, will be a necessary factor for economic growth.

2.3 The Global Economic Environment

The global economy will see four fundamental changes begin to emerge in the coming decade. The first will be the emergence of global trading blocks. NAFTA will likely expand to include South America. East Asia and Europe will also emerge as more formal trading blocks. The expansion of NAFTA would initially generate increased potential for U.S. exports as trade barriers fall, although any agreement to expand NAFTA would be incremental, and the impact would be slow in coming.

Longer term it would continue the movement of lower-wage industries from the U.S. as it improves demand for U.S.-made capital equipment and knowledge intensive services.

Trading blocks will solidify in Europe and will arise in East Asia as the industries and economies within these regions more closely integrate their operations to meet regional demand. This generates some potential for more contentious trading relationships with the U.S., although the risks are minor.

Second, growth of the huge Chinese market and its entrance into the World Trade Organization will generate major shifts in global trade patterns. Regional comparative advantages in Asia for manufacturing will shift toward China. In response, southeast Asian economies will shift toward higher-value goods and services, generating further competitive pressure for U.S. firms. But the growth of the Chinese market also offers strong potential demand for U.S. goods and services.

Third, aging populations in Japan, Europe and North America and the need to fund pension and health care services will place considerable fiscal burdens on government. Unless saving rates rise, expanding budget deficits have the potential to put pressure on interest rates over the next 15 to 20 years in high-income countries, providing further comparative advantage to emerging economies.

Fourth, increased standardization in existing high-tech industries will lead to further transfers of business operations to low-cost economies. This leads to an increasing importance of the ability of the U.S. to develop emerging industries, which will require sufficient capital investment. But even more importantly, it will require ever improving human capital from which innovation originates.

The remainder of this section will discuss these factors in greater detail in relation to the expected pattern of the global economy in the coming years.

Pattern of Global Recovery. The economy of the industrialized world is in the midst of a nascent recovery. However, the strength and pace of the rebound is more tepid than previously expected. As a result, the potential boost to overall trade volumes will also be less vibrant. After rising nearly 13% in 2000, U.S. export volume fell by nearly 5% last year. The outlook has certainly improved but Economy.com projects that exports from the U.S. to the rest of the world will continue to decline this year before rebounding quickly next year.

The rebound in the global business cycle will drive export demand first for primary and intermediate commodities. As manufacturing production picks up, demand for industrial supplies, commodities, and natural resources should rebound the quickest, followed by intermediate goods, and then advanced final goods. Among intermediate goods, however, the tech slump will linger in the near term as business investment in IT networking equipment, computers and components remains weak before rebounding in 2003.

Given the diverging performances of various industries in the early stages of the recovery, individual countries will recover at different rates, thereby influencing trade flows between the U.S. and its trading partners. Those experiencing rising incomes will be well placed to increase demand for U.S. goods. Increased demand for natural resources and industrial commodities will certainly benefit East Asia, namely Malaysia and Indonesia, which are among the most commodity dependent economies in East Asia. South Korea is poised to lead Asia out of recession as its sales of household appliances and autos and auto parts in U.S. markets have been crucial in offsetting weakness in its troubled IT investment market.

Europe's recovery will lag behind that of Asia. The pace of the recovery across the continent is uneven with Spain, Ireland, and France showing the firmest conditions, followed by Italy. On the other hand, the manufacturing-dominated north central portion of the euro zone, namely Germany and the Netherlands, remains weak and

continues to weigh on the outlook for the entire region. Lastly, Latin America suffers from some of the more severe downside risks for a near-term recovery, namely overburdening debt problems, stubbornly high inflation and an unstable political environment. As a result, the economic turmoil in Brazil and Argentina is weighing on the economic outlook for this region, which will therefore be one of the last to recover.

Export Risks. Near term, the risks to the outlook for exports remain on the downside. The slump in demand for IT equipment is expected to extend through the end of this year. So, an even more anemic economic recovery could delay the rebound of global business investment. Moreover, the impact of the 9/11 terrorist attacks is an increase in the cost of shipping in and out of U.S. ports due to increased security measures and insurance costs.

Longer term, Arizona's dominant export product, electrical and computer equipment, will improve. With business investment expected to rebound over the course of 2003, such improvement in demand conditions for high-tech industries will feed through to exports. Aside from overseas demand for intermediate components, emerging economies in Asia and eastern Europe, with relatively undeveloped telecom infrastructures and a growing need for enhanced communications systems, will generate demand for IT equipment, providing upside potential for exports.

The entry of China into the WTO in December 2001 also provides substantial upside potential for overall trade volumes. The opening of the world's most populous consumer market could be a boon for makers of a variety of durable goods and also the providers of telecommunications, financial, and insurance services, especially after tariff reductions are completed by 2005. Similarly, high-end consumer goods and specialty food products could find expanded market potential in China and elsewhere. The pace of economic reforms, however, and hence the ability of other countries to realize the full benefits of trade with China, remains an area of uncertainty.

A Special Case: Mexico. Weak U.S. demand has caused a cyclical decline in shipments of maquiladora products, generating near-term weakness in Mexico's manufacturing industries. But the industry itself has become less competitive globally over the past year, causing the industry to shrink and thus reducing demand for exports of intermediate goods from Arizona. Ironically, the NAFTA trade agreement is a contributing factor to the industry's current woes; the agreement, enacted in 1994, required Mexico to strip maquiladoras of their duty-free status by 2001 for intermediate goods originating outside of North America, causing the prices of some imported raw materials and intermediate goods to rise (see Chart 14).

The attractiveness of Mexico as a destination for foreign direct investment has subsequently fallen, prompting companies to shift some operations to Asia and the Caribbean. As a result, many of the jobs and production at maquiladora plants lost over the past year will not return quickly. A cyclical upturn in the U.S. and Canada and a weaker peso will provide some near-term stimulus. But expectations for the industry's long-term growth, and hence the potential growth of exports from Arizona, may be weaker as Mexican industry restructures toward more high-value industries in the coming years.

Over the remaining years of this decade, higher-value industries in Mexico will have less reason to locate close to the U.S. border. This may well provide some improved comparative advantages for Arizona. In the early years of free trade with the U.S., producers needed to be within a fixed distance of the border to gain tax-advantaged status for imported intermediate inputs. Given the smaller size of the Mexican communities adjacent to Arizona compared to those along the California and Texas borders, Arizona benefited less. Mexican industry in the future will be less concentrated on the border, and it will produce higher-value products with a higher

Chart 14: Maquiladoras Losing Competitive Edge

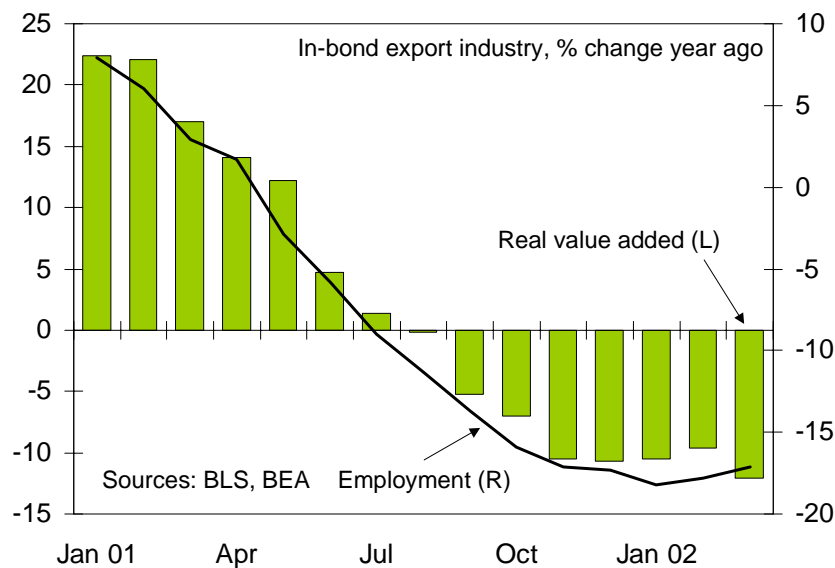
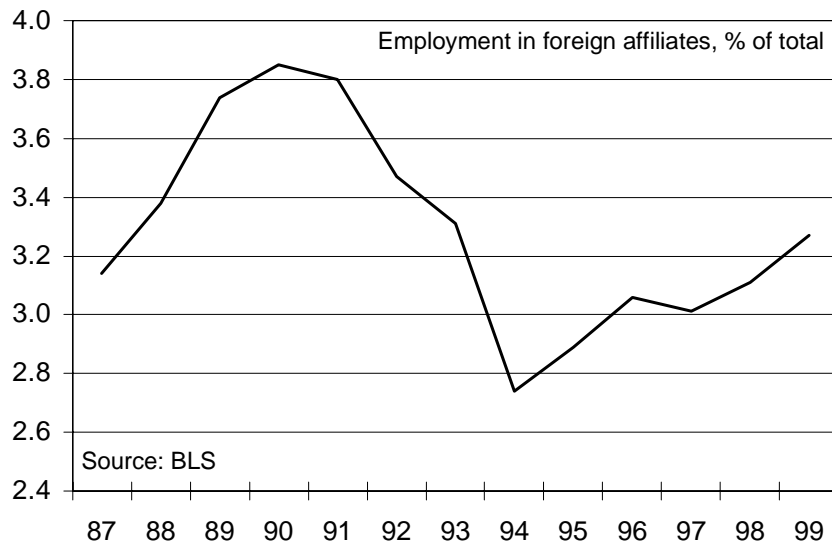


Chart 15: Foreign Affiliates in Arizona



value-to-weight ratio. Thus, lengthening transport links between such production locations as Hermosillo, Guadalajara, and even Monterrey, and markets in the American Southwest and Pacific Northwest place Arizona squarely in the middle of this expanding supply-chain management and marketing distribution pattern.

Foreign Direct Investment. Foreign direct investment (FDI) in Arizona has grown, most noticeably in the second half of the 1990s, and has contributed to boosting the state's economic prosperity. Relative to other states, however, Arizona does not rank highly in terms of the number of workers employed by foreign companies as a share of total employment, ranking 42nd out of 50 states (see Chart 15).

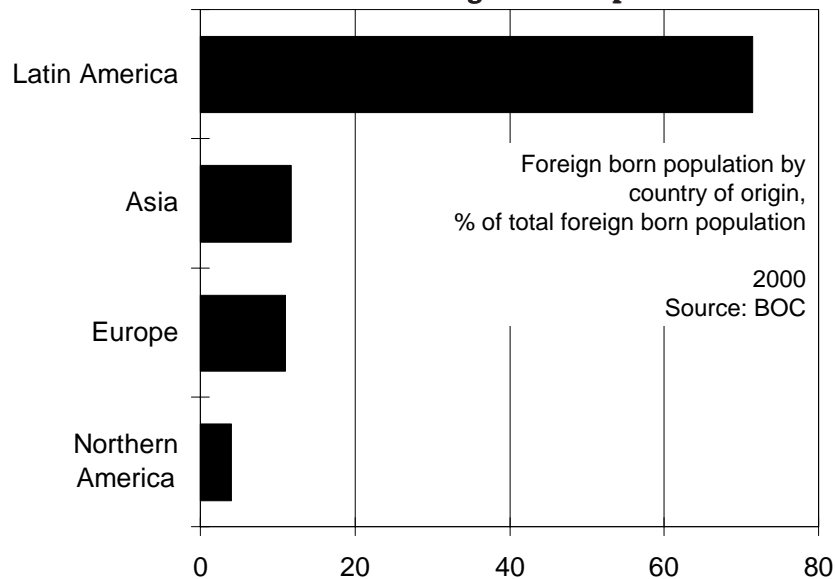
There are several reasons why growth in FDI accounts for a smaller share of total employment compared to other states like Hawaii, the Carolinas, New Jersey, and Connecticut. Most investment capital comes from investors in Canada and Europe, who favor the East Coast due to its proximity and its densely populated markets. In the case of Hawaii, that state benefits from its proximity to East Asia.

Arizona attracts more of its FDI from Asia due to the strong presence of electronics and electrical equipment in its industrial base. Investment in commercial property by Asia-Pacific affiliates accounted for nearly 35% of all foreign commercial property investment in Arizona in 1999 (the latest available data) compared to 30%, nationally. Moreover, growth in Asia-Pacific investment in Arizona has grown at a pace that far outpaced the nationwide average. In 1987, investment from this region accounted for only 3% of total FDI in Arizona, compared to just over 20% of national FDI during the same year.

Manufacturing has been the driving force behind growth in jobs provided by foreign companies, accounting for 20% of total FDI employment. Indeed, the state's well-established tech base served it well in rejuvenating FDI in the late 1990s. Looking forward, the state has several structural factors that should serve to attract further FDI once the Pacific Asian economies fully recover. A high quality of life, affordable housing, favorable business costs and strong population growth will all serve to attract further FDI longer term.

Immigration. Strong rates of net in-migration have boosted population growth in Arizona and will continue to do so across the forecast horizon. More specifically, international migration has supported the state's population growth. Final estimates for immigration into Arizona over the past decade are not yet available from the 2000 census. However, there are statistics on the number of Arizona residents born outside the U.S., which provides insight into the important role that the state plays in

Chart 16: Mexico Dominates Foreign-born Population in Arizona



absorbing the nation's immigrants. According to 2000 census data, Arizona's foreign-born population had risen by 150% to over 656,000 during the 1990s, accounting for over 25% of the population increase over the decade. Of these new foreign-born residents, over 70% originated from Latin America, mostly from Mexico (see Chart 16).

The 1990s represented the continuation of an emerging trend where growth in the foreign-born population accounts for a rising share of Arizona's population growth. Indeed, while total population growth was actually stronger during the 1960s, foreign-born population growth reached new heights in the 1990s. Arizona's population grew by 74% in the 1960s, while the foreign-born population grew by only 50%. However, during the 1990s, Arizona's total population grew by a still-

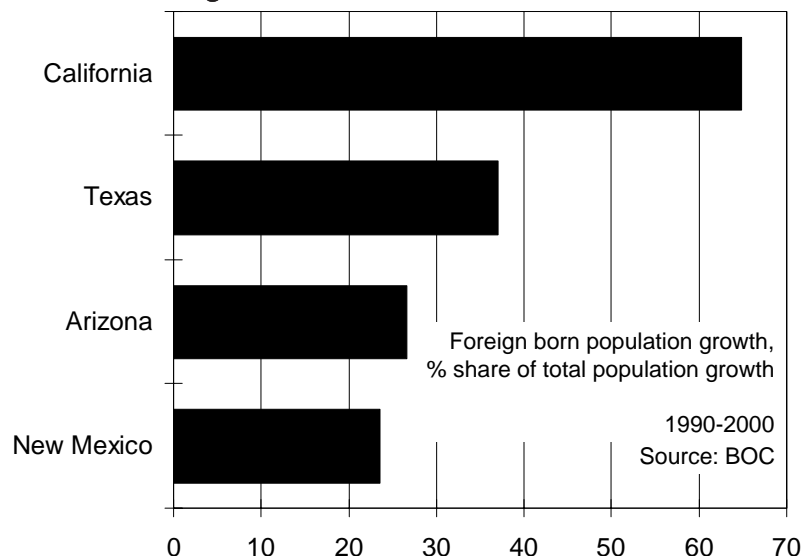
strong 40%, but foreign-born population surged by more than 150%. While many of these new residents may have migrated to Arizona from within the U.S., impending census figures on immigration will likely illustrate that the relative economic performances of Arizona and neighboring Mexico during the 1990s encouraged strong international migration directly into Arizona.

Indeed, the role of documented and undocumented Latin American immigrants in driving foreign migration trends was stronger in the 1990s than the previous decade; the presence of Latin Americans in Arizona's foreign-born population grew by nearly 190% during the 1990s. Arizona's proximity to the region means that, like the other border states of California, New Mexico, and Texas, Latin America figures substantially in its demographic pattern. However, relative to California and Texas, it appears that international migration accounts for a smaller share of total population growth in Arizona (see Chart 17).

It is more than a fleeting coincidence that growth in the foreign-born population was strong during the past decade. The 1990s marked for Arizona a period of strong economic growth. Conversely, it was period of volatility for the Mexican economy during the mid-decade peso crisis and the later contagion of the global economic crisis in 1998. Continued cross-border migration will depend upon the relative growth of the Mexican and U.S. economies going forward. If indeed the border-region maquiladora industries continue to downsize or move offshore, the unemployed in Mexico would have further incentives to migrate to the U.S. However, as Mexican industry begins to move up the value chain, and if Mexican industry can successfully locate in some of the poorer regions of the country farther south, regions that are major sources of immigration to the U.S., the tide of immigration would slow. The U.S. economy will continue to provide a significant pull factor for immigration, but it is unlikely that it will be as strong as it was during the second half of the 1990s.

Financial Investment. Direct foreign investment in Arizona will face friction in the coming years from an easing of capital flows into the U.S. There are four reasons for this changing trend in capital flows.

Chart 17: Other Border States Absorb More of the Nation's Immigrants



First, interest rates spreads between the U.S. and global markets are widening. Signs of resurgent inflation in the euro zone, in particular, are causing interest rates there to rise ahead of rates in the U.S. This is causing the European Central Bank to begin tightening monetary policy earlier in an effort to rein in inflation. Higher interest rates in Europe will cause some shift in capital flows toward Europe.

Second, a depreciating dollar further discourages direct foreign investment in the U.S. As the dollar diminishes in value, dollar based earnings translate into less local currency when profits are repatriated, meaning that overall returns to foreign investment in the U.S. are diminished.

Third, productivity in the U.S. will continue at a strong pace in coming years. But increased capital investment and the potential for some easing of restrictive labor laws in Europe generate some potential for accelerating productivity growth in Europe and elsewhere in the coming years. This too adds friction to foreign capital flows as investors find investment opportunities outside of the U.S. increasingly attractive.

Finally, the uncertainty of U.S. equity markets may continue longer term should there be continued revelations of accounting and business irregularities among publicly traded companies in the U.S. Overseas investor sentiment already is showing its willingness to shift to local equities rather than to continue to direct investment toward the U.S.

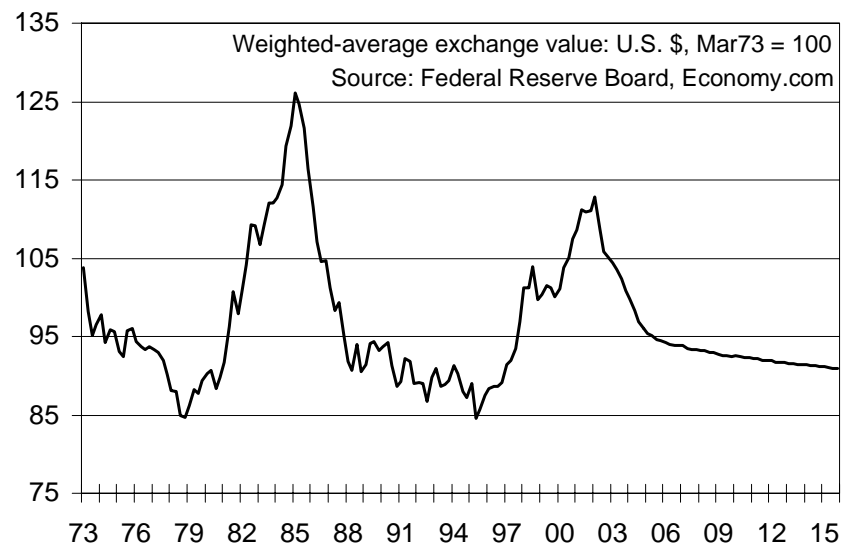
With these four factors potentially working against the continued long-term flow of capital toward the U.S., it will be more difficult to attract foreign investment than in recent years. During much of second half of the 1990s and through the months immediately following 9/11, the U.S. was consistently seen as a safe haven for investment as well as a place where strong productivity growth would generate higher returns for investors. Risks to the future pace of foreign investment in the U.S. are largely on the downside going forward, with considerable uncertainty caused by continued threats of terrorism in the U.S.

Dollar/Price Effects. Were it not for the counter-intuitive movements of the dollar over the past year, the U.S. recession would have been more severe. The current account deficit, now 4% of GDP, and the economic recession indicated that the dollar should have weakened throughout 2001. With an economic recovery on the horizon, the dollar should then have begun to appreciate as U.S. exports rebound and potential returns on equity investment become more attractive.

Instead a more severe economic downturn overseas, strong productivity growth that promised higher returns, and the global role of U.S. financial markets as a safe haven resulted in an unyielding appetite for U.S. stocks, bonds, and derivative investments. The dollar began a period of self-propelling appreciation as the stronger dollar boosted the U.S. returns of foreign investors, fuelling yet more investment from overseas. But this trend is now over and the dollar will continue to depreciate in the near term and will remain near a decade low as foreign investment portfolios become less concentrated in U.S. equities (see Chart 18).

The result will be cheaper prices for U.S.-made goods overseas, and more expensive prices for imported goods in the U.S. This will give more pricing power to U.S. firms within domestic markets as they will not have to compete so rigorously with imports. It also means that U.S. exports will gain greater acceptance as they become more price competitive in the global market. Thus, a managed and gradual deflation of the U.S. dollar will generally have positive impacts on the U.S. economy. The most important downside effect will be a moderate boost to inflation as import prices rise and domestic producers attain greater pricing power for their goods.

Chart 18: Dollar Will Fall Further



3. Arizona's Future At Risk

3.1. Arizona Within The U.S. And Global Environment

Limits of Current Economic Structure. Arizona's current economic structure poses some significant downside risks for the remainder of the decade. Current drivers of the economy will play a key role in the future only if at least one of the following occurs. First, if an industry faces extraordinary exogenous demand in the coming years due to changes either in demographic trends, fiscal policy or global trade. Second, if an industry is able to increase its productivity through workforce improvements and capital investment. Third, if an industry is able to develop new technology or to become an early adapter of new technology. Fourth, if an industry can remain competitive with global producers through any of the three factors above.

Dynamic Industries. Among the dynamic industries of the past decade, only amusement and recreation services has a clear positive outlook due to exogenous demand drivers. Demographic trends drive this optimistic outlook as baby boomers have increasingly higher disposable incomes as they age, and are increasingly willing to travel and spend on related services. Also, the children of boomers are coming of age and will be demanding amusement and recreation services at an accelerating pace.

There also is further potential for public relations and management services, particularly as firms require help to transition to increasingly flexible business models foreseen in the coming years.

Mining and manufacturing of construction materials will remain stable at best, but there is little chance of any acceleration in demand as the Southwest and the entire nation are coming off of a building boom that will not likely be repeated for some time. Transportation services is an industry that will have to change rapidly as ticketing and freight brokerage services and logistics come to rely increasingly upon the Internet. Medical and health insurance carriers will face severe cost pressures in coming years as medical costs rise and the ability to raise rates diminishes.

The potential for some of the dynamic industries is great, but each faces challenges in terms of the proper application of technology and use of its capital and labor resources. Thus, the dynamic industries may still drive Arizona's economy, but they will need to continue to transform to meet the challenges of the future.

Growing Industries. Among the three industries in this category, missiles and space vehicles retains very good potential due to exogenous demand from rising defense expenditures. But challenges remain, as defense needs shift from the Cold War to the war on terrorism. Thus, future exogenous demand is not yet fully understood.

The banking industry offers good potential as well, but will not likely accelerate its presence unless regional or national financial service operations stake a greater presence in Arizona and adapt to changing financing needs of emerging industries. Business services, however, do retain very good potential as their broad array of high-tech services, including computer programming and the increasing need for temporary help services help reshape an expanding economy.

Stable Industries. The stable industries present the greatest risk to the economy in the coming years. The airline industry, for example, is in serious financial trouble. Phoenix-based America West was the first airline to request federal loan guarantees following the falloff in air travel demand post-9/11 and others are following. The change in airline travel not only poses serious financial difficulties, but also is forcing the industry to completely reevaluate its business practices. Technology plays an increasingly large role in the management of route structures, and the capital/

labor ratio is in flux as the industry reconsiders its labor contracts. The industry could be facing another period of consolidation as the decade progresses.

Electronics manufacturing faces serious competitive threats from overseas producers in line with emerging U.S. and global trends discussed above. While the near-term outlook should improve with a global economic recovery, the longer-term future of this industry will depend on the amount of research and development work that continues locally and that generates new products that are R&D intensive such as medical or advanced measurement and controlling devices.

Real estate and insurance agents are more symptomatic of “growth-related” industries in Arizona. In other words, they grow simply because of strong migration and the income and wealth that are brought to the state by migrants. Thus, they offer little potential to drive the economy going forward and are not even basic industries in the true sense of the word. The federal government also generates little upside potential. If anything, as the defense department claims a larger share of the federal budget, federal agencies within the interior and agriculture departments could face stable budgets at best.

Some upside potential is evident for the aircraft and parts industry as exogenous defense spending filters through the broad aerospace industry. Arizona ranked 9th in 2001 for total defense procurement spending and 5th when ranked by procurement spending as a share of gross state product, underscoring the state’s exposure to defense spending. Similarly the lower-paying restaurant business generates some upside potential from a long-term rise in tourism spending. But here there is a strong contrast between the potential for high-paying jobs in the highly productive aerospace industry, versus lower-paying jobs in tourism and hospitality. Tourism would have more upside potential to drive the economy if it had a larger component within cultural activities and the arts.

Thus, while the stable industries represent some of the state’s largest employers, and many of its jobs are very well paid, there is a greater risk that many of these industries contract in the coming years rather than remain stable components of the economy.

Deconcentrating Industries. Of the deconcentrating industries, the hotels and lodging industry does offer some upside potential as travel demand catches up to the industry’s overcapacity. Thus, longer term, hotels and lodging may once again provide good potential for economic growth as supply is more balanced with expanding demand.

Crop and soil preparation services and the broader agriculture industry does offer some upside potential in the West and Southeast regions of the state, but only with some significant investment in the industry that intensifies its use of capital and more intensive processing of raw commodities.

Metal mining is in the midst of a long-term secular decline within the state and nation. As long as resources remain, the industry will continue to contribute to the economy, but at a decreasing rate.

Limits of Arizona’s Export Structure. Arizona’s export markets are important for the economy. Commodity exports of \$12.5 billion amounted to nearly 8% of total gross state product in 2001. This is not far from the national average of just under 7%, but it does rank Arizona eighth in terms of export exposure. Thus, the downturn in export markets, starting first with the global financial crisis in 1997-1998, followed by the global economic downturn that began in 2001 has played a significant role driving Arizona’s economy in recent years.

Export Commodities. Arizona’s export markets drive a narrow range of industries that play an outsized role in the state’s economy, namely electronics and aerospace. Electronics accounted for 44% of state commodity exports in 2001;

transportation equipment (largely aircraft and aerospace equipment in Arizona) accounted for another 20% (see Chart 19). Thus, nearly two-thirds of Arizona's exports are produced by just two of its industries. And, indeed, by just a few of the state's largest firms.

This concentration is higher than average. The median exposure to states' single largest commodity is 32%. When summing up all state exports by commodity, no industry accounts for more than 23% of the total. The median exposure to states' two top commodities is just 47%, well below Arizona's 64%.

Export Destinations. The range of export destinations is less concentrated, with 29% going to Mexico, 11% to Canada, 8% to the U.K., 7% to Malaysia and 5% to France. The majority of exports to Mexico, Canada and Malaysia are electronic products. Trade with the U.K. has shifted quickly from electronics to aerospace products over the past five years. Trade with France is nearly all in aerospace (see Chart 20).

Chart 19: Narrow Range of Exports

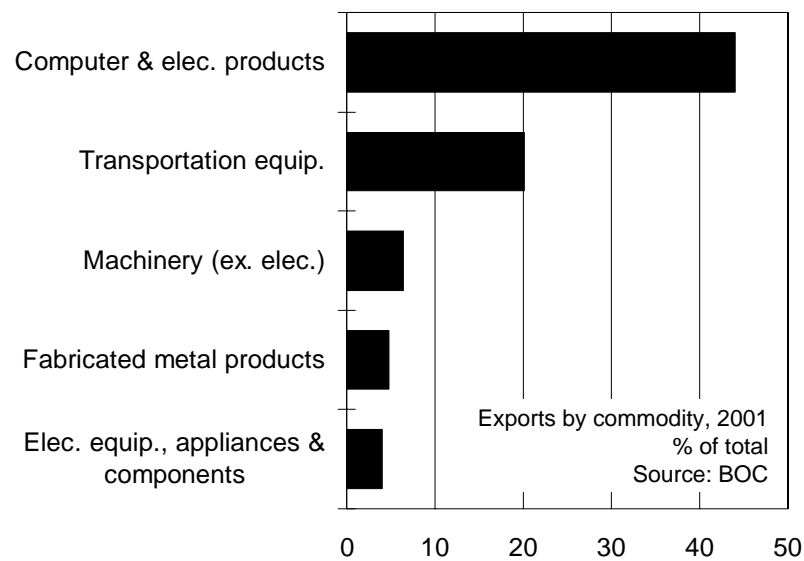
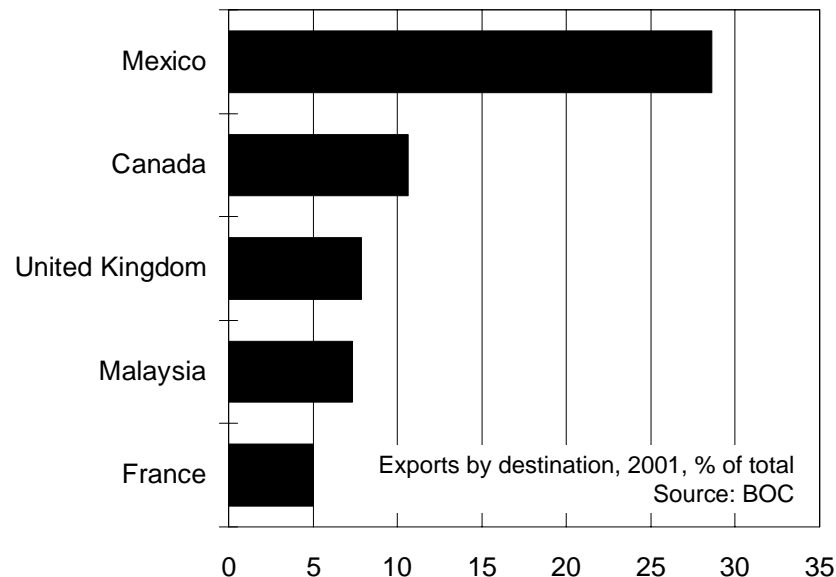


Chart 20: Five Largest Export Destinations



Arizona's concentration of export destinations is close to the median value for all states. The median exposure to states' top destination is 27% of total exports. The median exposure to states' two largest destinations is 37%, just slightly below Arizona's exposure to Mexico and Canada. Indeed, Canada and Mexico are the two largest export destinations for many states across the nation.

Arizona's proximity to northern Mexico's manufacturing centers generates the only diversified trade pattern that the state has with any nation. While electronics account for one-third of Arizona's exports to Mexico, plastic and rubber products account for 13% and electrical equipment another 10%. Other machinery, fabricated metal products, and paper each account for between 5% and 10% of exports to Mexico. Most of these products are intermediate goods used in Mexico's manufacturing industries. Many of these goods are technology intensive such as composite-materials products that go into auto parts and other components.

Two factors help determine the pace of trade with Mexico. First, because so much of Mexico's manufacturing economy is dependent upon export markets in the U.S., demand for most of Arizona's export products to Mexico is ultimately dependent upon U.S. demand. Second, the value of the Mexican peso is a determinant of Mexico's competitiveness globally. Clearly, the U.S. recession caused much of the downturn in Arizona exports to Mexico as demand from maquiladora and other manufacturing plants in Mexico fell drastically. Second, a strong peso that had risen by over 10% versus the dollar since its low point in the second half of 1998, combined with the loss of tax-advantaged status for manufacturing inputs from outside of North America, has discouraged direct foreign investment in Mexico. Indeed, there was some exodus of manufacturers from Mexico to other less expensive locations in the Caribbean, Asia and Africa.

Arizona's narrow range of export products and destinations is similar to other states that rank highly for export exposure. Exports amount to 10% to 16% of GSP in Washington, Vermont, Texas, Louisiana and Michigan. Trade in Washington, Vermont and Michigan is dominated by a single commodity (aerospace, semiconductors and automobiles, respectively). Texas's trade exposure is much like Arizona's with a dependence upon tech equipment to the world and intermediate goods to Mexico, although Texas's Mexican trade is more exaggerated due to its numerous border crossings and the shorter distance between Mexican manufacturing regions and U.S. markets through Texas. Louisiana's trade links are largely due to agricultural commodities.⁵

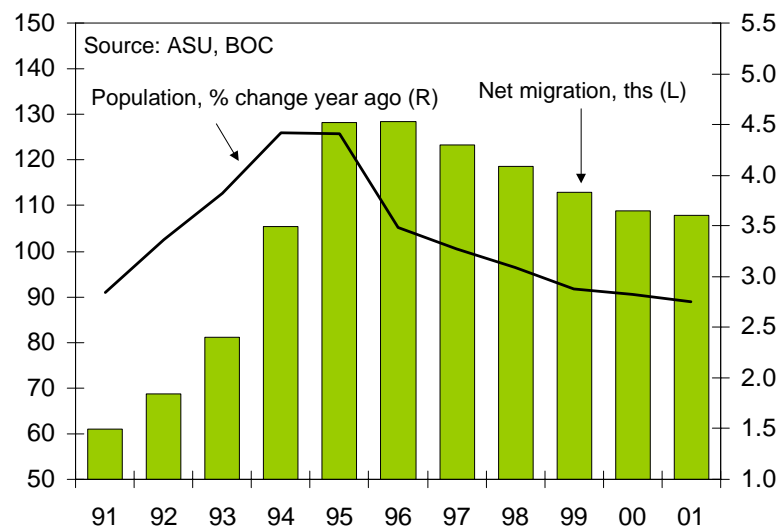
3.2 Dependency Upon Migration And Growth

Migration is the key determinant of Arizona's population growth, and indeed is critical in driving components of its economic growth (see Chart 21). During each of Arizona's business cycles since 1970, more than 60% of population growth has been due to migration.⁶ Nationwide, the average has been less than 30%. Moreover, while international immigration is an important factor in Arizona's population growth trends, domestic state-to-state migration accounted for approximately 75% of Arizona's total annual migration in 2001 according to the Census Bureau. The impact of domestic migration is even higher in nearby Nevada (80%), but less in other major destination states such as Florida (68%) or Texas (37%). Thus, the pace

⁵ Trade data for Louisiana actually are biased upward because many of the bulk agricultural commodities stored and then shipped from Louisiana ports are actually produced elsewhere within the Mississippi, Missouri and Ohio valleys.

⁶ As defined by ASU's Center for Business Research, the business cycles are 1971-1975, 1976-1982, 1983-1991, 1992-2001.

Chart 21: Migration As Source of Growth



of domestic migration is an important determining factor of Arizona's demographic and economic trends.

The pace of migration into Arizona will remain high during the remainder of this decade, although population growth will slow moderately. By 2010, the current rate of population growth will slow from the current 2.8% to between 2.4% and 2.6%. By 2020, the rate is expected to slow to between 1.9% and 2.2%.⁷ These rates will be influenced by relative regional economic trends as well as by the shifting age composition of the U.S. population.

Workforce migration. The impact of relative economic growth on migration is evident from trends over the past twenty years. For example, whenever Arizona's economy outperformed other regional economies, particularly California whence the largest migration flows originate, then net migration to Arizona accelerates (see Chart 22).⁸ At the end of the last expansion and into the 2001 recession, however, differences in relative regional growth rates narrowed nationwide. This is unusual since the cyclical pattern of earlier recessions generally exacerbated regional differences. Economy.com expects that going forward, through the remainder of the decade, that regional differences in economic performance will remain smaller than usual, thus minimizing any cyclical surge in migration that might drive unusually strong growth in Arizona.

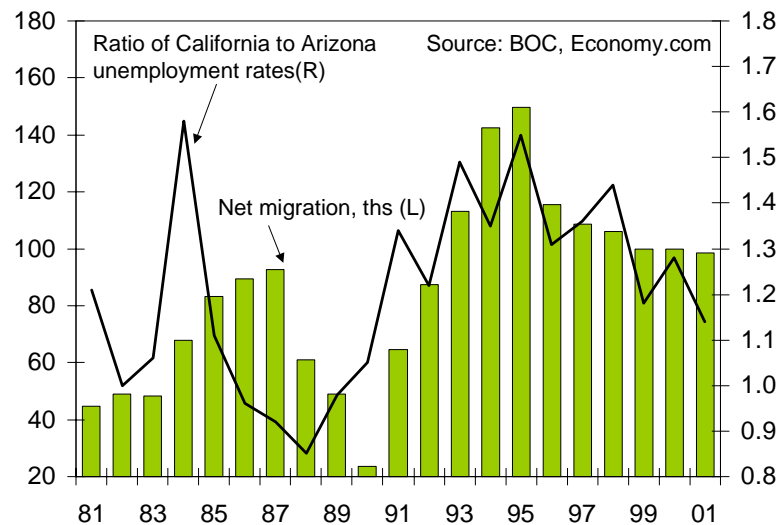
Retiree migration. Retiree migration also could moderate slightly during the course of this decade, but much depends upon the age at which baby boomers begin searching for and buying retirement homes. It will certainly accelerate by the end of the decade. If boomers delay buying retirement homes until they are 65, then retiree migration could slow through the course of the decade. The first wave of the baby boom will reach age 65 in 2011.⁹ For the past decade, however, more than half of new Social Security recipients have opted to collect benefits at age 62, indicating the

⁷ The lower forecasts are from ASU's Center for Business Research. The higher forecasts are from Economy.com.

⁸ According to Internal Revenue Service change of address data, California was the largest net source of migrants during the 1990s, and the second largest source (behind Illinois) during the 1980s.

⁹ The baby boom lasted from 1946 to 1964.

Chart 22: Migrants Follow Job Opportunities



median retirement age to be about 62.¹⁰ This would date the edge of the boomer retirement wave to 2008. Further uncertainty is created by the greater wealth of the baby boom generation over their parents', which means a large portion of them could choose to retire before 2008. Already, the growth rate of the 55 and over population nationwide is beginning to accelerate, and many active retiree migrants to Arizona are under 60 years old. Thus, if there is a slowdown in state-to-state retiree migration in the near term, it may be short lived.

A final risk to future migration arises from the uncertainty about whether boomers will mimic their parents in migrating long distances to enjoy a warmer climate and amenities during their retirement years. Thus, the scale and dynamics of national aging trends indicate that Arizona will see rather steady retiree migration, but there is some near-term risk on the downside.

The greater risk is that the pace of workforce migration slows if the pattern of regional economic performance remains even across the U.S. While the long-term secular trend of migration will favor the warmer climates of the U.S., a diminished push factor out of the Northeast, the Midwest, the Pacific Northwest and California could moderate domestic migration.

Economic consequences. A steady pace of retiree migration would indicate that some of the current pattern of economic growth will continue. This means continued reliance upon construction activity as well as an over-reliance upon industries such as real estate and local financial and business services that are not normally considered basic economic drivers. This would perpetuate some of the current economic structure in which the production of construction materials remains rather dynamic, that real estate and insurance service industries remain large and stable, that construction employment stays higher than average and that retail and other personal service industries also expand. None of these are usually considered basic economic drivers, but in this case they rely on a continuation of exogenous factors that bring income and wealth into the state, rather than upon the internal dynamics of the economy. Additionally, most of these are low value added and low wage industries.

¹⁰ Gendell, Murry, "Boomers' Retirement Wave Likely to Begin in Just 6 Years", *Population Today*, A publication of the Population Reference Bureau, 30:3, April 2002, pp. 1-2.

The risks to workforce migration are greater since domestic migrants provide valuable skilled labor required for many of Arizona's dynamic, growing and stable basic industries. Should workforce migration slow, the local workforce would have to fill the gap. By some measures, the local workforce is less skilled and experienced, thus diminishing the potential for productivity gains in the near term.

3.3 Education and Workforce Quality

Workforce quality is a significant contributor to Arizona's quality of life as well as a key factor in defining its economic competitiveness. A number of such measures indicate that workforce quality is one of the weakest components of the state's comparative advantages. In the years going forward, workforce quality will be a key factor in insuring continued growth of productivity, keeping it competitive with other regional and international economies.

Primary and Secondary Education. Arizona ranks equal to the U.S. average for educational achievement as measured by the share of the adult population that has earned at least a high school diploma (see Chart 23). Compared to other states, Arizona ranks behind competitors such as Washington State, Colorado and Oregon, but it does rank ahead of California's average attainment.

A deeper look reveals more troubling indicators, however. Arizona ranks last in the nation in terms of high school completion at 73.5% according to the National Center for Education Statistics (see Table 3). The U.S. average is 85.7%. The high school completion rate measures the share of persons aged 18-24 who have completed high school, as opposed to the more static ratio of all adults aged 18 and over that hold high school diplomas. Even worse, the state ranks 47th in the nation for the share of high school graduates that enroll in college, with only 45% of all high school graduates in Arizona enrolling in college, as opposed to 57% nationwide.

Measures of student proficiency and achievement at the K-12 level are below average. Students in Arizona, on average, rank consistently below the national average in most math and science proficiency tests. Arizona's eighth graders do fare better than those in California and New Mexico, but they lag behind nearby Colorado and Utah (see Chart 24).

Chart 23: Educational Attainment

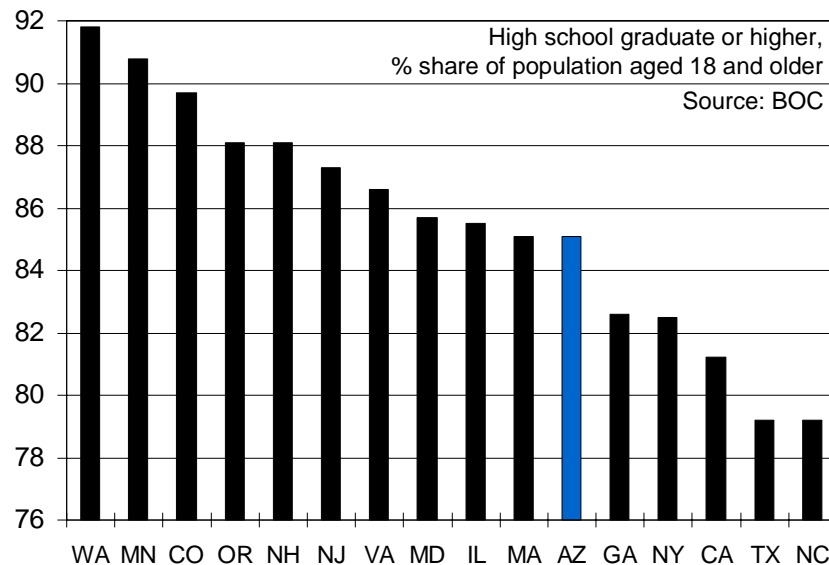
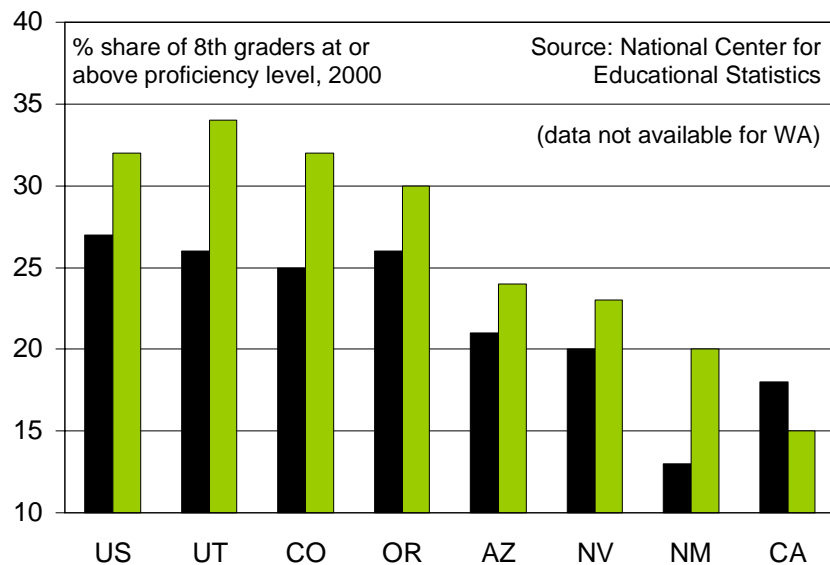


Table 3: High school completion rates for 18-24 year olds not currently enrolled in school, 98-00, %

State	Completion rate, %
U.S.	85.7
Maine	94.5
North Dakota	94.4
Alaska	93.3
Missouri	92.6
South Dakota	92.0
Minnesota	91.9
Hawaii	91.8
Connecticut	91.7
Nebraska	91.3
Montana	91.1
Delaware	91.0
Massachusetts	90.9
Iowa	90.8
Vermont	90.8
Kansas	90.4
New Jersey	90.1
Utah	90.0
Wisconsin	90.0
West Virginia	89.6
Indiana	89.4
Michigan	89.2
Pennsylvania	89.0
Tennessee	89.0
DC	88.0
Rhode Island	87.9
Ohio	87.7
Maryland	87.4
Washington	87.4
Virginia	87.3
Illinois	87.1
Wyoming	86.5
Idaho	86.4
New York	86.3
Kentucky	86.2
North Carolina	86.1
Oklahoma	85.7
New Hampshire	85.1
South Carolina	85.1
Florida	84.6
Arkansas	84.1
Georgia	83.5
New Mexico	83.0
California	82.5
Mississippi	82.3
Oregon	82.3
Louisiana	82.1
Alabama	81.6
Colorado	81.6
Texas	79.4
Nevada	77.9
Arizona	73.5

Source: National Center for Education Statistics

Chart 24: Below Average Proficiency in Arizona



School funding is a problem, although it is now being addressed by the state. While state spending on K-12 education in FY 2001 (latest data) ranked second to last among the states according to the National Center for Education Statistics, spending is rising and is getting a boost from Proposition 301, passed in November 2000. The state auditor general estimated in March that the 0.6% sales tax authorized by Prop. 301 would raise \$444 million for K-12 and higher education in FY2002.¹¹ Of this, about 16% was to be dedicated to revenue bond debt service payments, 10% for university research and 3% for community colleges. The balance, amounting to nearly 60% of the fund after subtracting such dedicated funding, is distributed to school districts, which use most of their allocations to boost teacher salaries. With teacher salaries in Arizona among the lowest in the nation, Prop. 301 funds will help recruit and retain talented teachers.

A solid K-12 education system is an important factor in determining the competitiveness of an economy. Workers with high school diplomas provide much of the support that keeps an enterprise going from day to day driving trucks, performing clerical work, keeping warehouses humming and doing construction and repair work, for example. Costs for internal training can skyrocket for support staff if they are not adequately trained or educated. This lesson is being learned by a number of manufacturers, for example, that have migrated to some of the rural areas of the Southeastern U.S. where labor costs are low. High training costs are, in part, offsetting the low wages there.

Colleges and Universities. College education also is a critical factor of competitiveness. A strong post secondary educational system can help provide a talented pool of skilled labor and entrepreneurs. College-educated residents have higher average earnings than do residents with a high school diploma, and that gap

¹¹ *Arizona Public School Districts' Planned Uses of Proposition 301 Monies*, Report to the Legislature, March 2002, Office of the Auditor General, State of Arizona.

has been increasing (see Chart 25). Furthermore, a strong system of research colleges and universities is a prerequisite for supporting innovation in various high-tech fields. Research done at universities typically provides the seeds for new technologies and they generate entrepreneurs among the faculty and students. Thus, a strong university system can even partially offset the detrimental effects of a weak K-12 school system by bringing in talented students and faculty from outside the state, and retaining them in high value-added industries.

Indeed, Arizona has significant assets in its public university systems located primarily in Tucson, Phoenix and Flagstaff. The University of Arizona, located in Tucson, is the largest research university in the state, and ranks 13th in the nation in terms of total R&D funding received among large public university systems. Arizona State University in Phoenix is the largest university in the state with a student body approaching 50,000 and ranks 56th in the nation in terms of total R&D funding received. It should be noted, however, that there are few private colleges or universities in the state. Among them are the Thunderbird Graduate School of Management with its focus on international business, and the University of Phoenix with its focus on adult and distance learning.

Furthermore, the share of adults with college degrees in Arizona is very near the national average, as is the mean SAT score for Arizona high school students (see Table 4). Where Arizona seems to falter is in state spending for higher education, where it ranks 41st on a per capita basis. Similarly, state university salaries are below average and student teacher ratios are somewhat higher than average (see Table 5). Despite this, the universities rank at or above average for their quality of students, as measured by the SAT scores of incoming freshmen. Thus, Arizona's universities do indeed represent considerable assets to the economy, although low funding puts them at longer-term risk.

Arizona's state-run universities are operating under tight budget constraints and the situation deteriorated significantly during the 1990s. Per capita state funding for higher education fell by over 35%, from \$210 to \$133, between 1991 and 1998, according to reports from the Joint Legislative Budget Committee in Arizona. The funding deficiency for Arizona's higher education facilities compromises its competitiveness as a center for research and innovation in the nation. It makes it

Chart 25: A College Degree Is Increasingly Valuable

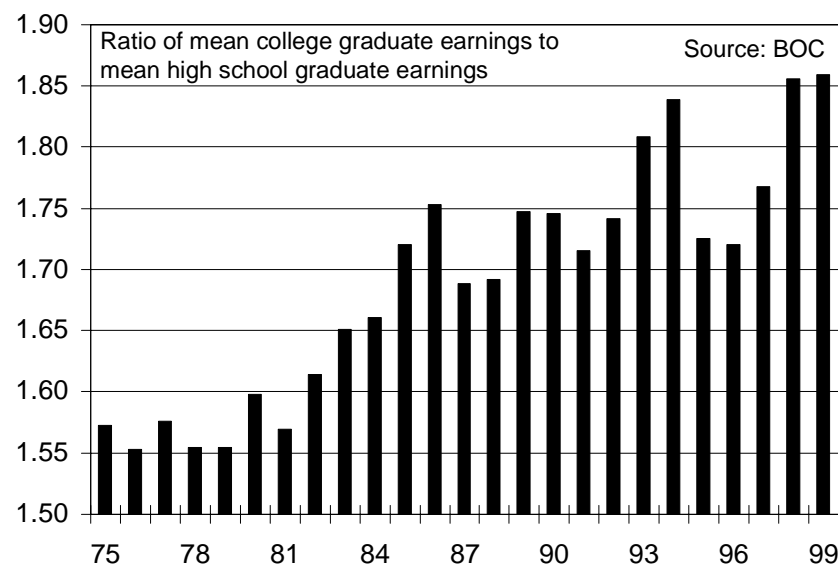


Table 4: Educational Attainment Indicators

State	% share of pop. aged 25 yrs. & over w/ Bachelors degree or higher, 2000	Rank	Mean SAT score, 2001	Rank	Per capita spending by state for higher education, FY 2002	Rank
Alabama	19.0	44	1,113	16	250.0	16
Alaska	24.7	20	1,024	31	322.6	3
Arizona	23.5	24	1,048	27	179.0	41
Arkansas	16.7	49	1,112	17	242.7	17
California	26.6	12	1,015	36	274.4	11
Colorado	32.7	2	1,081	22	177.3	42
Connecticut	31.4	3	1,019	33	222.5	27
Delaware	25.0	19	1,000	43	237.7	21
Florida	22.3	31	997	46	172.1	43
Georgia	24.3	22	980	49	202.7	34
Hawaii	26.2	13	1,001	40	285.3	7
Idaho	21.7	35	1,085	21	250.4	15
Illinois	26.1	14	1,165	5	234.2	22
Indiana	19.4	43	1,000	44	216.1	31
Iowa	21.2	38	1,196	1	284.0	8
Kansas	25.8	16	1,157	7	265.5	14
Kentucky	17.1	47	1,100	18	266.8	13
Louisiana	18.7	45	1,126	13	223.5	26
Maine	22.9	27	1,006	39	186.4	40
Maryland	31.4	3	1,018	34	241.4	18
Massachusetts	33.2	1	1,026	30	158.3	48
Michigan	21.8	34	1,133	10	227.6	25
Minnesota	27.4	10	1,169	4	278.1	10
Mississippi	16.9	48	1,117	14	282.0	9
Missouri	21.6	36	1,154	8	186.4	39
Montana	24.4	21	1,078	23	165.6	44
Nebraska	23.7	23	1,130	11	306.6	5
Nevada	18.2	46	1,024	32	164.7	47
New Hampshire	28.7	8	1,036	29	85.5	50
New Jersey	29.8	5	1,012	37	211.6	32
New Mexico	23.5	24	1,093	19	334.2	2
New York	27.4	10	1,000	41	188.0	36
North Carolina	22.5	28	992	48	298.4	6
North Dakota	22.0	32	1,191	2	317.8	4
Ohio	21.1	39	1,073	24	193.9	35
Oklahoma	20.3	41	1,128	12	238.4	19
Oregon	25.1	18	1,052	26	205.8	33
Pennsylvania	22.4	29	999	45	165.6	45
Rhode Island	25.6	17	1,000	42	165.2	46
South Carolina	20.4	40	974	50	220.7	29
South Dakota	21.5	37	1,159	6	187.6	37
Tennessee	19.6	42	1,115	15	187.0	38
Texas	23.2	26	992	47	238.0	20
Utah	26.1	14	1,145	9	268.1	12
Vermont	29.4	7	1,017	35	119.4	49
Virginia	29.5	6	1,011	38	234.0	23
Washington	27.7	9	1,054	25	229.4	24
West Virginia	14.8	50	1,039	28	217.6	30
Wisconsin	22.4	29	1,180	3	220.8	28
Wyoming	21.9	33	1,092	20	344.0	1
U.S.	24.4		1,020		225.5	

Source: Census Bureau; College Board, Center for Higher Education and Educational Finance

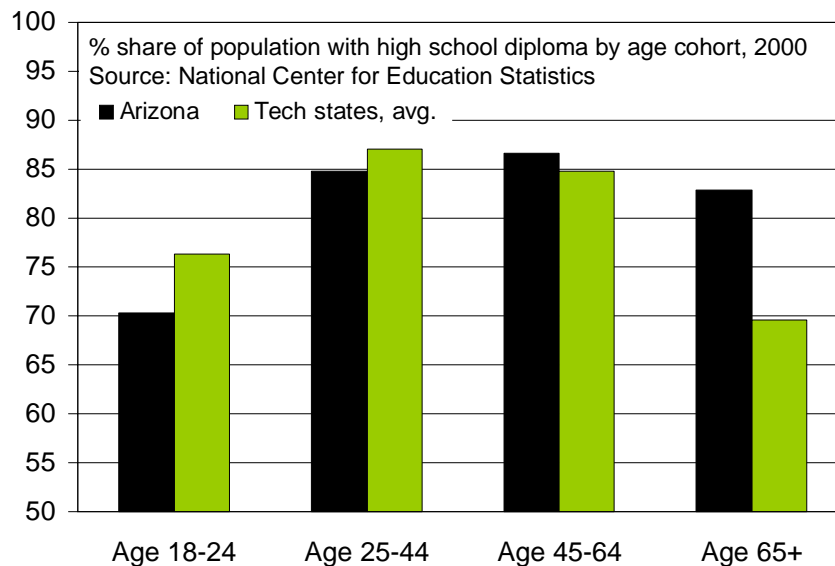
Table 5: College Indicators

Universities	1999 Median SAT Scores:		Prof. salary		Student/ faculty ratio Median = 15
	Rank among 481 nat. universities	Rank among 289 public universities	\$	% below peer median	
University of Arizona	171	84	\$84,900	9.4	18/1
Arizona State University	167	81	\$85,000	9.3	20/1
Northern Arizona University	243	134	\$67,500	15.0	17/1

Source: The Center, University of Florida; U.S. News and World Report

difficult to attract and retain scholars within the system. Moreover, when top scholars depart for posts elsewhere, they often take with them colleagues, graduate students, research assistants, and outside research funds. Prop. 301 does channel research funds to the universities, thus marking some improvement in university funding sources.

Migrant Workforce Quality. One redeeming factor supporting the quality of Arizona's workforce is its ability to attract migrants to the state that do have high educational attainment (see Chart 26). Markedly, Arizona's share of high-school educated residents is considerably lower among its 18-24 year age cohort, the cohort that is most likely made up of locally educated residents. While it should be expected that older age cohorts would have a higher proportion completing high school given the additional years available to complete secondary education, a comparison with competing tech-related states shows that the difference in Arizona is much higher. This indicates that Arizona is able to supplement its intellectual capital by attracting migrants with high school and college diplomas. The impact of migration is most evident among the 65 years and over age cohort. Unfortunately, these retirement-age migrants participate less in the workforce and thus contribute less to its productive capacity.

Chart 26: Migrants Add to Intellectual Capital

4. Methodology – Arizona’s Comparative Advantages

4.1 Analytical Methodology

Regional economics can be described as the assessment, measurement and modeling of comparative advantage. While all regional economies within the U.S. function under identical macro assumptions such as monetary and fiscal policy or foreign exchange rates, each has a unique set of comparative advantages that can drive regional growth above or below the national average. A state may have advantages that support its entire economy, such as workforce quality or demographics as discussed above. Similarly, income trends, household balance sheets and credit quality help determine the ability of both households and firms to invest in the economy, as well as how fluidly the multiplier impacts of investment filter through the local economy. Other factors may have more specific impacts on individual industries. These might include the cost of doing business, the cost of living, availability of investment capital, the quality and quantity of various components of infrastructure, or the general quality of life. Furthermore, some factors of comparative advantage can be influenced directly through policy; others are beyond the range of public policy intervention.

A multi-step process is taken, therefore, to describe and analyze Arizona’s comparative advantages. First, through modeling techniques, we establish relationships between the regional comparative advantages and the location of specific industries. This is done through a series of panel regressions that compare differential growth rates of employment across all states for each industry as defined by 2-digit SIC codes and determining a statistical relationship, if one exists, between the location of industry growth and individual measures of comparative advantage. These results provide some indication of the relative importance of various measures of comparative advantage to the outlook for economic development.

Second, it allows for the identification of industries that may be underrepresented in Arizona based on the statistical relationships established in the first step. These relationships then help identify potential future economic opportunities.

Third, the relationships of policy-related factors of comparative advantage are employed to develop alternative scenarios for Arizona’s economic outlook.

4.2 Factors of Comparative Advantage

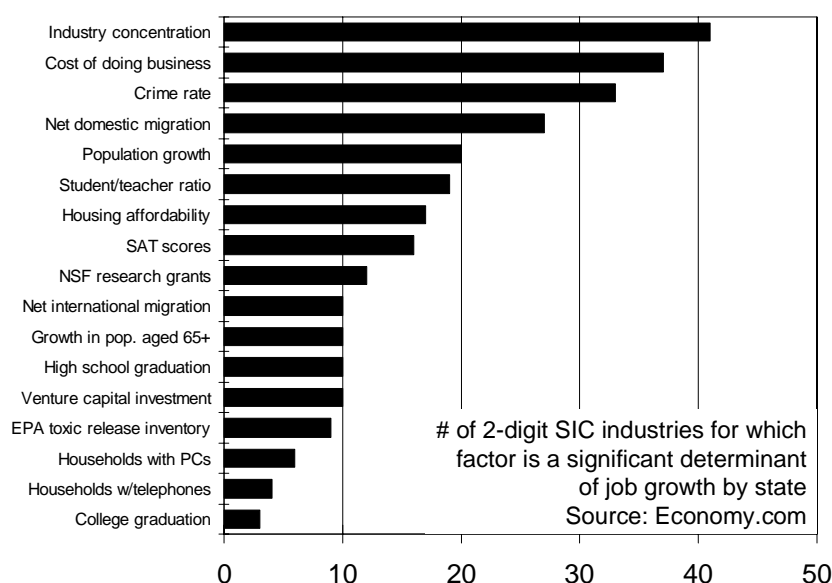
Statistical relationships between measures of comparative advantage and individual industries vary widely (see Chart 27). It should be no surprise that the most commonly significant factor upon the growth of an industry is the existing presence of that industry.

Industry concentration. One measure, the current concentration of the industry, was a significant variable for over 40 of the 75 industries as defined by the 2-digit SIC system. This indicates the importance of understanding the current industrial structure of a region, and that similar kinds of businesses often cluster near one another such as banking in New York or auto making in Detroit.

Costs. Second, costs were also frequently significant. The cost of doing business and, less frequently, the cost of living were among the measures showing the most frequent relationship with the location of industry growth.

Quality of life. Third, quality of life does seem to matter. This is a difficult factor to quantify consistently across states. The crime rate is one such measure, which ranked just below costs of doing business as a frequently significant

Chart 27: Factors of Comparative Advantage



determinant. Another measure, the EPA's toxic release inventory, proved to be less frequently significant.

Demographic factors. Fourth, the significance of demographic factors such as population growth, distribution of age cohorts or migration was more limited. Their significance was related most directly to wholesale and retail trade, personal services, and the manufacture of lumber and timber products for construction.

Workforce quality. Fifth, measures of workforce quality rank near the middle. The student/teacher ratio and SAT scores showed significant relationships with between 15 and 20 industries. These include retail trade and a number of high-end services such financial, legal, health and engineering and management. It is interesting to note that among the measures of educational attainment, completion of a high-school degree was significant for retailing, financial services and miscellaneous business services and a number of manufacturing industries, including electronics. A college degree had limited relationships to the individual industries, indicating that firms may well have to recruit less-skilled workers from a local labor pool, but when searching for skilled labor, a broader regional or national recruitment process may be used. It is also evident that the share of adults with college degrees in the population does have a relationship to per capita income growth more than it does to employment growth. This will be discussed later in Section 6 of this report.

Innovation. Sixth, measures of innovation and technology penetration showed mixed results. The dollar value of National Science Foundation grants showed a statistical relationship with ten industries, including the manufacture of electronic components (at the 3-digit level) and high-tech instruments, communications, and legal, education and engineering and management services. Measures of technology penetration such as households with telephones or PCs had little relationship to industry location, perhaps because these technologies are so ubiquitous.

Capital. Finally, venture capital also showed a statistical relationship with ten industries. They include the larger financial services industries such as nondepository institutions and securities firms, with which VC firms often are affiliated. Indeed, financial services in general, and venture capital in particular, are among the most concentrated of all industries. It also is interesting to note a significant relationship

between construction and VC firms, perhaps indicating the role that VC plays in the expansion of industries within an economy.

4.3 Arizona's Measures of Comparative Advantage

This section reviews measures of comparative advantage specific to Arizona. These measures are discussed in order of factors most easily influenced by public policy to those least capable of being directly influenced by policy. This discussion is not limited to the indicators described above that illustrated a significant statistical relationship with the location of industries. It is often difficult to establish these quantitative relationships, yet they are often cited as determinants of regional growth. The discussion progresses from measures of business climate to quality of life, workforce quality, infrastructure, demographic patterns, and finally to credit quality and household balance sheets.

4.3.1 Business Climate and Quality of Life

The long-term economic wellbeing of an economy is influenced to a large extent by the business climate in the state. A mix of geographic realities, political and economic history, and policy choices made by local and national decision-makers typically molds the business climate of a state. An important determinant of a region's economic competitiveness is its cost of doing business, including its tax burden, real estate costs and labor costs.

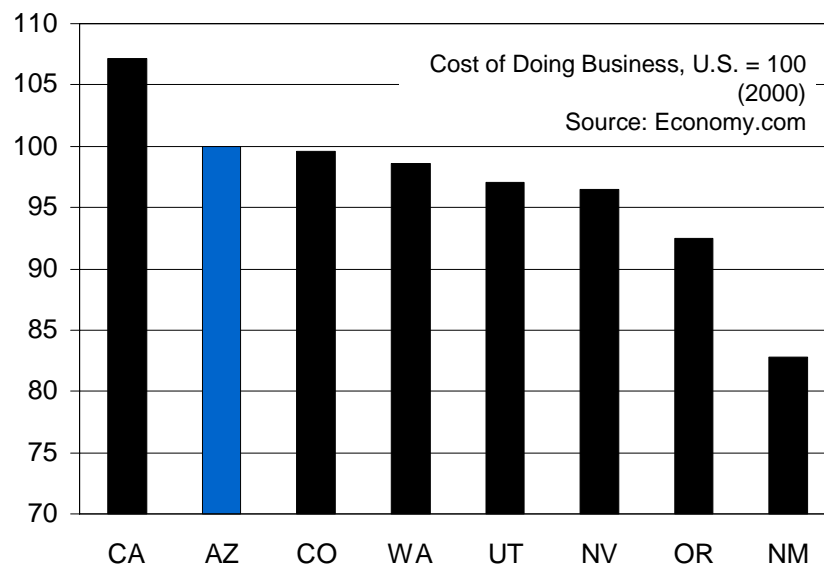
In as much as the success of a business depends on its employees, the quality of life and the quality of the workforce in a region also play key roles in determining the business climate of an area. Quality of life, as much as living costs, is an important determinant of migration decisions, and influences the ability of a company to attract and retain talent. Thus both the tangible cost of doing business and the socioeconomic wellbeing of residents are crucial in determining the business climate of a region.

Arizona is a competitive place to do business as far as costs are concerned, and it possesses some clear advantages when it comes to the cost of living and some quality of life indicators, such as the health of its residents. However, its poor performance in other areas, specifically in educational attainment and proficiency, leaves considerable room for improvement. In the emerging knowledge economy where information is quickly surpassing goods as the most profitable building block of economic growth, adequate educational attainment is a fundamental antecedent of business competitiveness. As a laggard in this arena, Arizona risks falling back in the race for talent and sustainable long-term growth.

Business Costs. Business costs in Arizona are on par with the U.S. average, as demonstrated by Economy.com's Cost of Doing Business Index (see Chart 28). Among its neighboring states, Arizona's business costs are similar to other states in the Mountain region, but well below those of California. The index has three components: state and local taxes, electric utility costs, and unit labor costs. Arizona's unit labor costs are just 1% below the national average and the overall tax burden is 3% below average.¹² The cost of energy, however, as measured by the unit cost of power for industrial users, is 8% above average.

¹² In the overall state business cost index, tax burdens are given a 10% weight, energy costs are given a 15% weight and unit labor costs are given a 75% weight. These weights are assigned based upon the importance of each cost component in explaining long-term regional employment growth. The index is configured so that the cost of doing business nationally equals 100. Thus, a state with a cost index of 110 has business costs 10% above the national average; an index of 90 means a state has business costs 10% below the national average. Unit labor costs are derived from BEA and U.S. data; energy costs from the Energy Information Agency; tax revenue from Census Bureau.

Chart 28: Arizona's Business Costs: Right on Average



The tax burden index is a measure of total state and local tax receipts relative to total personal income. The entire tax burden is included since firms often weigh both personal as well as corporate tax burdens when considering locations. However, it does mask a rather high corporate tax burden in Arizona, arising particularly from the real and personal property tax for commercial and industrial properties. The tax rate for C&I real property is 25% of assessed value according to figures from the Greater Phoenix Economic Council. The rate for C&I personal property is also 25% following an exemption of the first \$53,266 of assessed value.

This exemption is a help for small businesses, but it is only a help for businesses that stay small. It becomes less significant as a small business grows. Yet it is the small but growing firms that have the potential of becoming the new basic industries that drive the economy forward.

The purpose of this paper is not to conduct a detailed assessment of state tax policy, but recent research by Arizona State University concludes that “for Arizona to remain competitive in the market for mobile business capital, business taxes need to be reduced, especially property taxes.”¹³ Arizona also relies heavily on sales taxes, a portion of which is paid by visitors from out-of-state. Indeed, local jurisdictions often turn to raising sales taxes for new revenue needs. Meanwhile, personal income taxes are low. In fact, if the tax burden is normalized on a per capita basis, rather than on the basis of total personal income, the tax burden appears even lower. Arizona’s tax index on a per capita basis equals 82.6 or about 17% below the national average. This ranks the state 39th by this measure.

An important goal to strive toward is a balanced tax structure. The reasons are twofold. First, the tax burden should be shared equitably between households, businesses and visitors. Second, the exposure to cyclical risks in the economy should

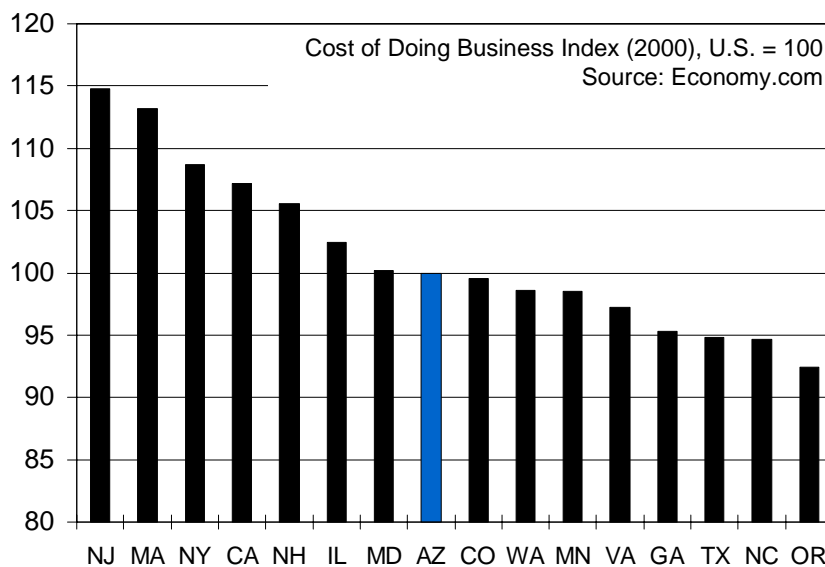
¹³ *A Current Assessment of Arizona’s Tax Competitiveness*, Center for Business Research, L. William Seidman Research Institute, College of Business, Arizona State University, February 2000.

be spread widely. For example, conventional wisdom has suggested that a state should not have too high of an exposure to sales tax revenue, because this is likely to fall rapidly during recession, just when revenue is needed to support safety-net programs such as unemployment insurance. But the recession of 2001 saw a greater fall in income tax revenue due to a large decline in realized capital gains, while consumer spending held fairly steady. The lesson from recent patterns is that it is difficult to accurately assess the risk exposure of individual sources of tax revenue, and thus revenue sources should be as balanced as possible.

What the state's competitiveness gains from aggregate lower tax burdens and nearly average unit labor costs, it loses from higher energy costs. Arizona ranks 13th in the nation in terms of energy costs. On average, electric power in Arizona costs about 8% more than the national average. While energy costs in the state are almost 20% below those in California, providing Arizona considerable cost advantage, it still ranks considerably higher than other neighbors like Colorado and Utah. To Arizona's benefit, the state is still pursuing a policy of deregulation, which could lead to lower power costs longer term. This contrasts sharply with policy in California, which has shifted back toward a regulated environment, raising rates last year to cover high power costs in 2001.

Not only are business costs about average for the U.S., Arizona also falls in the middle of the pack when comparing it solely to states with large technology components in their economies (see Chart 29). Generally, business costs in Arizona are below those of the tech-related states in the Northeast, as well as California's. Arizona's cost structure is slightly above states in the Southeast that compete for tech-related industries.

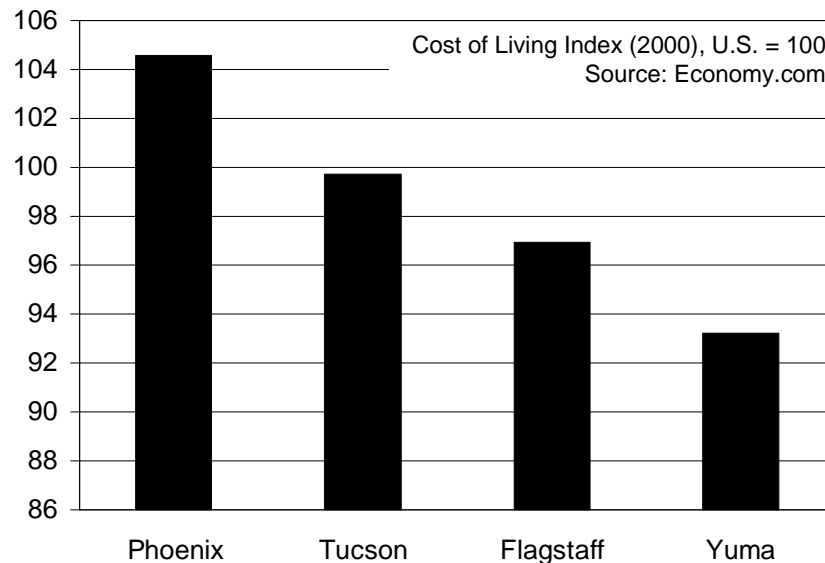
Chart 29: Arizona Business Costs Near Average Among Tech States



Regional disparities in the cost of doing business within Arizona follow predictable lines, with the larger, more-developed areas posting higher business costs than more rural areas. Above-average energy costs are a staple across all regions of the state, however.

Cost of Living. Cost of living indexes, which are estimated only by metropolitan area, show living costs diverging widely across Arizona's metropolitan areas. Like Arizona's cost of doing business, however, the cost of living is not far from average in the larger metropolitan areas of Phoenix and Tucson, and is below average elsewhere (see Chart 30).¹⁴ Similarly, Arizona's living costs are generally below those in most California metro areas, which dominate the top ranks of living costs nationwide and which are the origination points for so many migrants moving to Arizona. Phoenix is just above the national average at 105 and ranks 40th among all 318 metro areas in the nation. The Tucson metro area follows with living costs at par

Chart 30: Arizona Cost Of Living Indexes



with the national average and ranking 76th in the nation. The Yuma and Flagstaff metro areas have a strong advantage in their low living costs, which are 6% and 3% below the national average respectively. Flagstaff ranks 111th among metro areas for living costs, and Yuma's costs are even lower, ranking 182nd.¹⁵

When compared to other tech centers nationwide, Arizona's two major metropolitan areas fare better on living costs than on costs of doing business. Tucson's living costs are among the lowest and Phoenix's are below average for a tech center (see Chart 31).

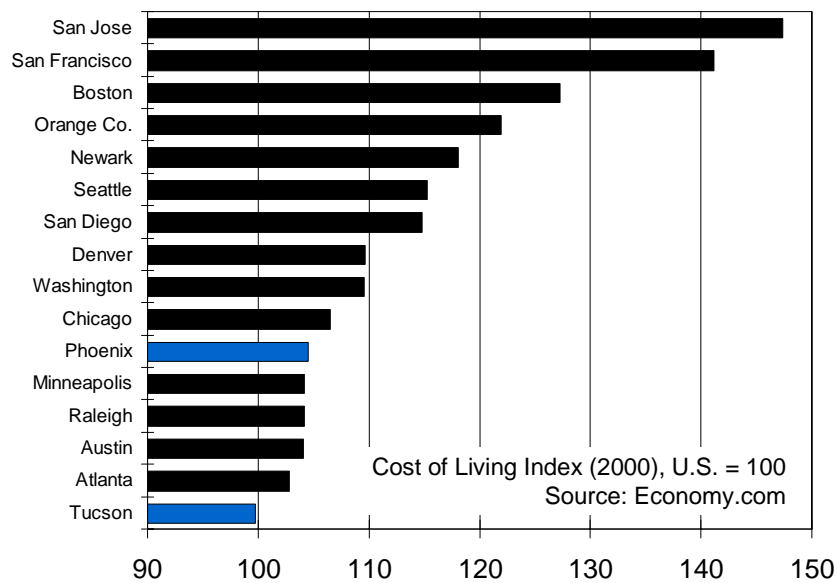
Arizona's housing affordability, defined as the ability of a household earning the median income to purchase a median-priced house, is near average for the U.S. Economy.com's housing affordability index for the state is 3% higher than the U.S. average. The median sales price of single-family homes in Arizona was \$134,000 in 2001, 12% below the national median home sales price of \$153,000.¹⁶ While Arizona has an absolute price advantage, lower household income pulls down the state's affordability index closer to average. Arizona's position relative to the U.S. has changed little over the past decade.

¹⁴ Metro area cost of living indexes have five components: housing, utilities, auto and driving expenses, auto insurance, and food and other consumables. The weights applied to each component vary for each metro area depending on relative consumption patterns. For example, utility expenses would differ between Flagstaff and other Arizona metro areas due to differences in climate. The Economy.com cost of living index differs from ACCRA indexes in several ways. First, ACCRA assumes a fixed basket of goods and services consumed. Economy.com's does not. Second, ACCRA data is available only for selected metro areas. Economy.com's index covers all U.S. metro areas. Third, ACCRA indexes are dependent nearly exclusively on survey data. Economy.com's index uses a variety of sources, most of which are government published.

¹⁵ Costs in Flagstaff are often considered high, primarily because of high housing costs. Indeed, the housing, auto, and auto insurance components of the index for Flagstaff are high. But lower costs for utilities and for food and consumables pulls Flagstaff's overall index slightly below the national average.

¹⁶ Note that this is the median price of all homes sold in 2001. It is not the median value of the entire stock of homes. The median sales price is derived from Multiple Listing Service data of the National Association of Realtors. A median value of the housing stock is based on owner assessments of home values as reported to the Census Bureau.

Chart 31: Arizona's Living Costs Lower Than in Most Tech Centers



Innovation. Arizona ranks well for measures of innovation. As measured by the number of utility inventions (i.e. patents for inventions) on a per capita basis, Arizona is right on the U.S. average. Moreover, after catching up with the national average in the late 1970s, it has kept up with the average as it has risen over the past two decades (see Chart 32). Arizona does not match some of the leading states such as Minnesota, Massachusetts and California, but it is clearly ranked within a second tier of states that compete for tech-related industries (see Chart 33). New York, Illinois, Washington State and Texas also are part of this second tier.

Chart 32: Arizona Does Not Lack for Innovation

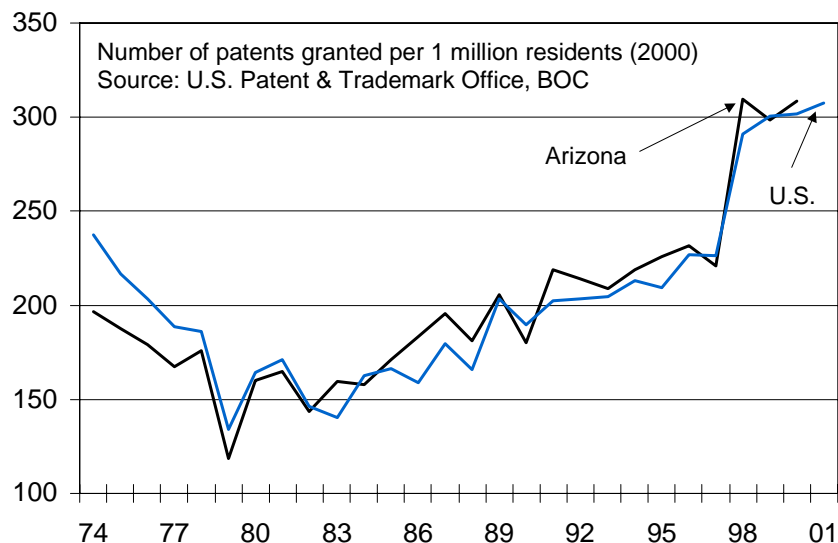
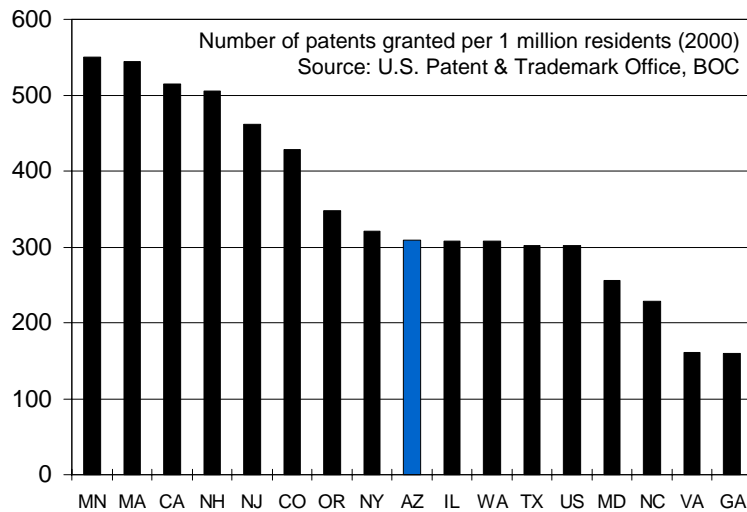
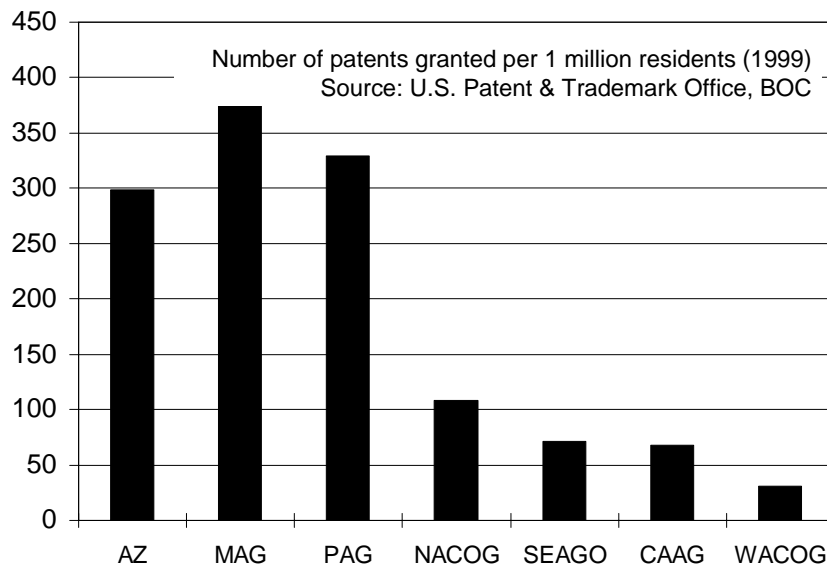


Chart 33: Arizona's Innovation in Second Tier of Tech States



The major metropolitan areas of Phoenix (MAG region) and Tucson (PAG region) clearly dominate the distribution of innovation within Arizona (see Chart 34). This should be no surprise since they are the largest commercial centers as well as centers of public and private research. Phoenix is home to Arizona State University; Tucson to the University of Arizona. Flagstaff (NACOG region) is home to Northern Arizona University and ranks third for patent awards. But it also should be noted that even the smallest regions in the state are sources for innovation as measured by patent awards.

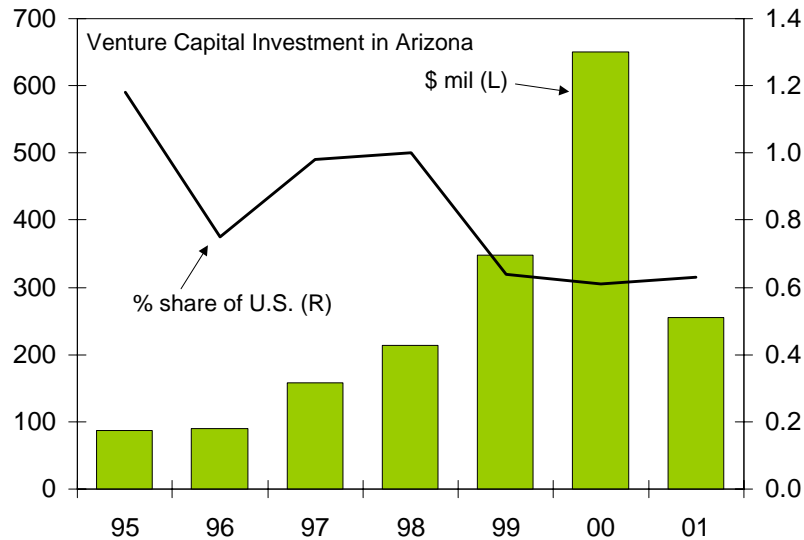
Chart 34: Evidence of Innovation Throughout the State



Another indicator of innovation is the amount of research and development spending that occurs each year. While this measure is volatile from year to year, the National Research Foundation reports that Arizona ranked equal to or better than the median for all states in terms of R&D spending per payroll worker by private companies, government and other research organizations over the period from 1997 to 2000. Spending per worker, however, was below average in each year except for 1999 due to a high concentration of R&D spending in states such as Michigan, Delaware, Washington, California, New Jersey and Massachusetts.

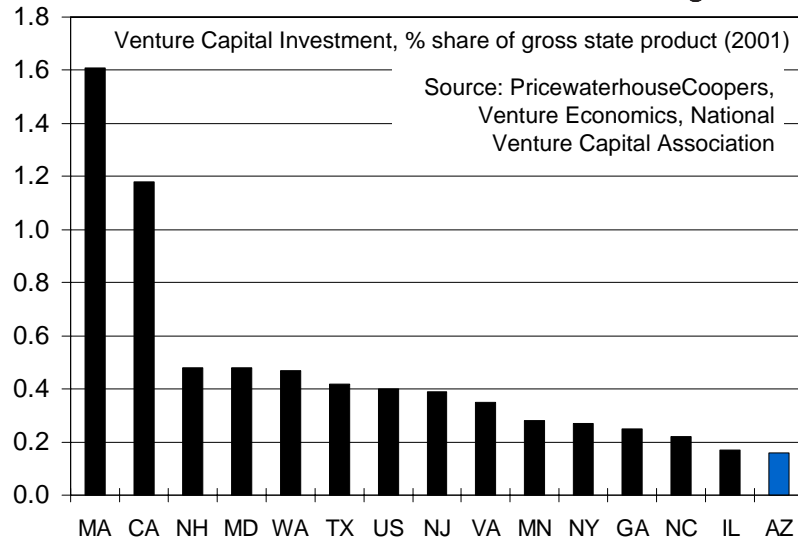
Venture capital. While patents and R&D spending may indicate a good level of innovation, the lack of venture capital indicates the difficulty that Arizona's industries may face in commercializing innovation (see Chart 35). Only once during the period 1995 to 2001 did Arizona's share of U.S. venture capital investments exceed 1% and that was in 1995. By comparison, Arizona's gross state product accounts for 1.6% of the U.S. total and the state's population equals 1.8% of the U.S. Moreover, as the economy boomed in the latter half of the decade and venture capital placements nationwide soared, the state's share fell by about half to 0.6% of the total.

Chart 35: Innovation Gets by Without Venture Capital



Arizona's apparent lack of venture capital is even worse when compared to the states with which Arizona competes for technology industries. Arizona ranks at the very bottom of these states when comparing venture capital investments as a share of gross state product (see Chart 36). Massachusetts and California clearly dominate the venture capital markets. Indeed, these two states are home to most of the venture capital firms in the nation. While Arizona is home to three VC firms according to the PriceWaterhouseCoopers/MoneyTree survey, California is home to 164 VC firms; Massachusetts is home to 67.

Chart 36: Arizona Does Not Fare Well for VC Among Tech States



The lack of venture capital represents a serious shortcoming to Arizona's economic competitiveness going forward. It means that small but innovative homegrown industries will likely face difficulties in taking new ideas and products to market and expanding operations. It also means that small and mobile entrepreneurs could very well be enticed to move operations to southern California, the Bay Area, or elsewhere to be near sources of venture capital.

Arizona's limited access to venture capital compared to its nearly average rate of patents granted and R&D spending is an indication that much of the innovation in Arizona may be coming from larger firms or from university research institutions that would have access to internal resources. Thus the state certainly demonstrates an ability to support new innovation, but it may have difficulty in encouraging such innovation by small entrepreneurs, and it certainly has difficulty in commercializing new technology.

Workforce quality. The quality of the workforce is a critical component of Arizona's business climate. As noted earlier, the aggregate quality of the workforce is about average when using measures such as educational attainment. Moreover, it is apparent that shortcomings of the locally trained workforce are overcome by the ability to attract skilled and experienced workers to move to Arizona. No doubt Arizona's labor pool will continue to be supplemented by workers moving to the state for its climate and way of life. But low proficiency of the local labor pool adds to the cost of doing business and creates limits to future economic growth. It adds to costs since every industry from high-tech research institutes to retail establishments depend upon local talent for many support positions. But additional training requirements will add to costs. Also, a dependence upon workforce migration puts Arizona's smaller metro areas and rural areas at a disadvantage as workforce migrants are often drawn to the larger metropolitan areas.

4.3.2 Infrastructure

Infrastructure is a factor that supports not only the economic competitiveness of an area's economy, but also the quality of life of its residents and its workforce. Infrastructure includes the transportation network (such as roads, bridges and mass transit), utilities (including water and sewerage), and increasingly, digital infrastructure (such as high-speed Internet connectivity). By most counts, Arizona has a sound infrastructure that has been improving over the past few years, thanks to a good pace of federal and state investment. The Corporation For Enterprise Development ranks states based on a number of development indicators annually. In 2001, Arizona secured an 'A' for its infrastructure resources. Arizona has been awarded the highest grade for the least reported deficiencies in road and bridge transportation. One reason for this grade is the relatively young age of much of the highway and other infrastructure in and around Phoenix and Tucson.

Telecommunications. Arizona is ranked 7th by the CFED in terms of its digital infrastructure, which is a measure of the progress made in improving digital service delivery to citizens. This, however, may be more due to the fact that a high share of Arizona's population resides in urban areas, creating easier access to telecom infrastructure. The smaller and sparsely distributed rural population has much greater difficulty gaining access to telecommunications infrastructure. In the aggregate, however, Arizona has a higher than average penetration of Internet and high speed connectivity. The state's share of households with home Internet access is higher than the national average. However, the state lags much of the West in this regard, falling behind California, Colorado, Utah and Nevada. Regardless of the level

of Internet penetration in the state though, the fact remains that Arizona has one of the highest ratios in the nation of actual cable laid for high speed internet access, and in terms of actual homes that have access to cable, well above the national average, and a slightly better than average rate of Internet connectivity (see Table 6).

Table 6: Internet Connectivity
Share of households with Internet Access, 2000

State	Percent Share	Rank
Alabama	35.5	44
Alaska	55.6	1
Arizona	42.5	21
Arkansas	26.5	50
California	46.7	9
Colorado	51.8	2
Connecticut	51.2	3
Delaware	50.7	5
District of Columbia	39.6	32
Florida	43.2	17
Georgia	38.3	36
Hawaii	43.0	18
Idaho	42.3	23
Illinois	40.1	29
Indiana	39.4	33
Iowa	39.0	34
Kansas	43.9	15
Kentucky	36.6	41
Louisiana	30.2	49
Maine	42.6	20
Maryland	43.8	16
Massachusetts	45.5	12
Michigan	42.1	24
Minnesota	43.0	18
Mississippi	26.3	51
Missouri	42.5	21
Montana	40.6	27
Nebraska	37.0	40
Nevada	41.0	25
New Hampshire	46.0	11
New Jersey	47.8	8
New Mexico	35.7	43
New York	39.8	31
North Carolina	35.3	45
North Dakota	37.7	39
Ohio	40.7	26
Oklahoma	34.3	46
Oregon	50.8	4
Pennsylvania	40.1	29
Rhode Island	38.8	35
South Carolina	32.0	48
South Dakota	37.9	38
Tennessee	36.3	42
Texas	38.3	36
Utah	48.4	7
Vermont	46.7	9
Virginia	44.3	13
Washington	49.7	6
West Virginia	34.3	46
Wisconsin	40.6	27
Wyoming	44.1	14

Sources: Census Bureau; National Telecommunications and Cable Association

Arizona's difficulties in telecom services are a matter of distribution rather than volume. The Phoenix and Tucson metropolitan areas, for example, are served by multiple providers of fiber optic long haul cable service. Elsewhere, such broadband access is limited or nonexistent. The distribution problem is even more acute when looking at basic telephone service, for which data is available from the Census Bureau. The problem is the worst in NACOG, where the share of households without telephone service ranges from 46% in Apache County to 25% in Navajo County and 12% in Coconino County. WACOG also has some limitations, where 10% of La Paz County households are without telephone service. This compares to less than 3% without service in Maricopa, Pima and Yavapai Counties.

Efforts are underway to increase telecommunications services to the more rural areas of the state, but these efforts will be constrained in the near term by financial conditions among the major service providers in the industry. If there is no change in the current geographic pattern of telecom services, then economic development will become even more concentrated in its central corridor and it will limit opportunities for the economy in the rest of the state.

Water. The long-term availability of adequate water resources is a key factor to Arizona's economic wellbeing, as it is in most western states. For the state of Arizona, the primary issue is not the aggregate quantity of water, but its quality and distribution. For example, Arizona has the right to use 2.8 million acre-feet of water annually from the Colorado River, but as of 2000 used only 2.65 million acre-feet. Even with current ample supplies, however, temporary shortages could arise during times of extended drought.

The three counties making up WACOG use Colorado River water as their main supply. Maricopa, Pinal and much of Pima County also rely on Colorado River water, for which up to a capacity of 1.5 million acre-feet can be delivered annually by the Central Arizona Project (CAP).

Sources of water other than the Colorado River and CAP are groundwater, other surface water, and effluent. Groundwater is a declining source, accounting for 45% of water use in 1994 compared to 67% in 1957. The Groundwater Code of 1980 limits well drilling in order to stop overdraft of the state's aquifers. Rising pumping costs also limit use of groundwater, particularly in Cochise County where groundwater is used for irrigated agriculture. Yet groundwater is still a major source of water for the Tucson area and for the SEAGO region of the state.

Irrigated agriculture is the largest consumer of water, accounting for nearly 80% of all water use in the state. Mining also is a major user in some regions of the state. Agriculture's share remained steady over the 1990s but is down from 92% in 1973 and 96% in 1957 according to the Arizona Department of Water Resources. This share will fall further as farmland converts to urban uses and irrigation techniques become more efficient. The 1997 census of agriculture indicates that Arizona's most urbanized county, Maricopa, also has the greatest amount of irrigated agricultural land. Pinal, Yuma and La Paz counties follow (see Table 7).

Water use in Arizona's central corridor is controlled by five Active Management Areas. The Phoenix, Prescott and Tucson AMA's are primarily concerned with assuring water supplies for urban and industrial use with the goal of balancing groundwater withdrawal and natural and artificial recharge. The Pinal AMA has a goal of extending its agricultural economy as long as possible while preserving water for non-agricultural uses. The Santa Cruz AMA has a greater concern regarding groundwater quality along border areas and preventing long-term decline of water tables.

The distribution of water supply throughout the state is a long-term problem that the state must continually address as it grows. The central corridor of the state, from

Table 7: Distribution of Irrigated Land Acres

	Total	Cropland	Pastureland and others
Arizona	1,013,902	963,966	49,936
WACOG	310,127	307,910	2,217
Mohave	13,105	12,030	1,075
La Paz	101,417	100,835	582
Yuma	195,605	195,045	560
NACOG	32,957	15,882	17,075
Coconino	2,832	1,127	1,705
Yavapai	9,229	4,450	4,779
Navajo	10,137	5,026	5,111
Apache	10,759	5,279	5,480
MAG			
Maricopa	297,636	293,535	4,101
CAAG	228,904	226,592	2,312
Pinal	227,725	226,274	1,451
Gila	1,179	318	861
PAG			
Pima	29,497	27,269	2,228
SEAGO	114,781	92,778	22,003
Graham	40,164	38,699	1,465
Greenlee	5,192	3,127	2,065
Cochise	63,252	50,341	12,911
Santa Cruz	6,173	611	5,562

Sources: 1997 Census of Agriculture; 2002 Arizona Statewide Economic Study, 2002 Arizona Statewide Economic Study

north of Tucson through Maricopa County and also further north into the Verde Valley, will have adequate supply from multiple sources, but will continually have to improve distribution facilities. Prescott does tap a groundwater aquifer, but some time in the future will have to import water from elsewhere. Tucson also relies largely on groundwater, augmented by some CAP water and will have to broaden its water sources. SEAGO has no CAP water and must deal with problems of groundwater quantity and quality, particularly in the border region. The WACOG region can depend upon Colorado River water. The rest of the state, including the NACOG counties and Gila County will have to continually work to develop water resources under statewide regulations and management programs. Pinal County has adequate CAP water but will have to transition from agricultural to urban demand as the county grows. Considerable investment will be required to transport raw water to growing points of demand throughout the state. According to the Water Infrastructure Finance Authority of Arizona, a total of at least \$1.6 billion will be needed to meet the state's 20-year needs for drinking water infrastructure and \$6.3 billion for wastewater, water reclamation and storm water infrastructure.

One further aspect of water distribution is the changing nature of water rights within the state. Arizona's Indian tribes are increasingly gaining access to increased water rights through the Winters Doctrine, which states that the tribes should be able to use the land that was allocated to them as reservations. A critical factor for the use of the land is water. Thus, reallocation of some CAP water and other water resources to the Indian tribes is being made. Some claims have been settled. There also are considerable unadjudicated water claims. As claims are settled, however, it means a continued reallocation of a finite amount of water resources that will continue into the future.

Highways. The CFED awarded the state an A grade for the quality of its highways and bridges. Indeed, the state has been rapidly improving its highway infrastructure, but most of the improvements have been concentrated in the Phoenix and Tucson areas. Yet the capacity and quality of the lengthy interstate and state highway systems that crisscross the state have not kept up with rapidly increasing demand.

A significant transportation issue that Arizona faces is the traffic along the Interstate I-10 corridor. The I-10 runs east-west across the state from California through Phoenix and Tucson, and on to New Mexico and other points east. This highway is most congested midway between Phoenix and Tucson, where Interstate I-8, running East from Southern California through Yuma, meets up with I-10. Over 40% of all traffic on I-10 below the I-8 junction is comprised of trucks, which ritually congest the highway between Phoenix and Tucson posing a hindrance both to interstate and intrastate transportation. A third lane on I-10 between Phoenix and Tucson is now needed and a fourth lane will probably be needed in the next decade. Indeed, as part of the CANAMEX highway, I-10 is a critical link of a proposed uninterrupted four-lane highway that would include I-19 from Nogales to Tucson, I-10 to Phoenix, and U.S. Highways 60 and 93 to Las Vegas, including a new bypass around Hoover Dam. Ultimately the CANAMEX highway would create a complete link between Mexico City and Edmonton through the Mountain region of the U.S.

A related issue that is adding to traffic congestion on routes between Phoenix and Tucson is the increased growth in Pinal County. Higher real estate costs in neighboring metro areas and relatively easier availability of land make Pinal County a prime growth destination. With new development in Pinal County, the region will need increased investment in transportation infrastructure.

Yet another issue of concern is traffic congestion going north on I-17 that connects Phoenix with Flagstaff and with I-40 that runs west-to-east from California through Flagstaff and on to New Mexico, the Texas panhandle and points east. I-17 gets most congested at points just north of Phoenix, specifically because of the slow speeds that large-haul trucks are forced to assume on the hilly terrain. Widening of the highway just north of Phoenix is needed soon and as the Phoenix metropolitan area grows to the north, further extensions of the widening would be needed as well.

The problem with I-40 is its age. It is one of the early sections of the Interstate Highway System and its surface is near the end of its 50-year life. To keep northern Arizona well connected to the rest of the Southwest and to facilitate interstate commerce a major reconstruction project will be required in the coming years.

Outside of the interstate system, highways 60 and 93 that provide additional access between Phoenix and points to the west are becoming increasingly congested and used for freight hauling. Highway 95 extending north from Yuma also is increasingly congested.

Another significant issue relating to transportation is congestion along the Arizona-Mexico border, specifically in Nogales and Douglas in the Southeast part of the state. Trucks transporting winter produce frequent the Nogales border crossing

and I-19 that connects Nogales with I-10 in Tucson. A combination of high truck volume and new border-crossing security results in significant backups in the region, which is a serious detriment to the perishable goods distribution business in southern Arizona. Further investment in expanding roadways connecting the border with the rest of the state's highways, and the possible development of new border crossings, will help ease this burden. Another potential improvement along the border region is at San Luis in southwestern Arizona, where a considerable amount of produce and other trade flows through to the Yuma area and then either to central Arizona or southern California.

Air Transport. Phoenix's Sky Harbor International Airport is a positive factor for the state's economy with sufficient capacity that includes parallel runways and ample gate and terminal space. Currently, Sky Harbor is the eleventh busiest airport in the world in terms of passenger boarding and fifth busiest as measured by aircraft operations according to 2001 rankings by Airport Council International.

Sky Harbor has been expanding runway and terminal space in order to keep pace with the strong growth in travel demand to the region. Capacity, as measured by the maximum number of flight operations possible per hour, was significantly improved at Sky Harbor with the addition of a third parallel runway, completed in October 2000. According to the FAA's Airport Capacity Benchmark Report 2001 this new runway boosted capacity at the airport by 36% during optimal "good weather" operating conditions. Between 137 and 146 flight operations per hour can now be handled during optimal conditions according to the FAA, and on-time performance of aircraft into Sky Harbor has been improved.

More importantly, this third runway greatly eases pressure on the airport during reduced or adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation. Capacity during these reduced conditions has improved an estimated 60% with the additional runway, giving air traffic controllers greater operational flexibility. The relief afforded by the third runway has given the airport considerable breathing room, as Sky Harbor currently operates well under maximum capacity throughout the operating day during both optimum and reduced conditions.

The completion of Terminal 4 in November 1999 brought an additional 12 gates on line, while additional parking garages have greatly increased the supply of available parking spaces at Sky Harbor. Terminal amenities, including additional restaurants and stores, have been expanded at Sky Harbor's other concourses, Terminals 2 and 3, through various remodeling efforts.

However, many ongoing and proposed near-term airport improvements have been shelved or postponed due to budget constraints, the weakened travel environment in the wake of 9/11, and community concerns about congestion and noise. Sky Harbor has already announced that it will not continue construction of approximately \$400 million worth of new projects, including a \$43 million economy garage and preliminary work on a megaterminal to replace Terminals 2 and 3.

Community concerns have also rekindled debate about the feasibility of long-term expansion and growth at Sky Harbor. The airport's location close to Phoenix's urbanized areas creates substantial noise pollution for surrounding neighborhoods. Thus there is some demand to follow the lead of other major metro areas such as Houston, Dallas-Fort Worth, and Denver and establish a larger airport well outside of the urbanized area. Continued expansion at Sky Harbor will be increasingly difficult due to a development crunch and various space constraints in the airport's immediate vicinity. These various concerns could derail a proposed fourth runway, which has been on the drawing board for over five years.

Despite these various constraints, Sky Harbor is well positioned to remain a significant driver of economic growth in the region over the next ten years when Sky Harbor's passenger traffic is expected to rise by 31%, according to the FAA. The recently added third runway has the airport currently running well below maximum capacity, giving Sky Harbor considerable room to grow and accommodate these higher traffic numbers over the next decade. Future expansion of the airport remains uncertain, as Sky Harbor becomes hemmed in by surrounding communities and developments.

The main drawback to air transportation in Arizona is the limited number of flights to the state's secondary metro areas. This should occur naturally over time as the metro areas grow, as long as adequate airport infrastructure is in place. Aside from the infrastructure on the ground, state and local policy could help jumpstart service by providing temporary guarantees of financial return to airlines that wish to test new service destinations. This has been done by other states, including California, in an attempt to better link their secondary metro areas with their primary commercial centers.

Natural resources & geographic location. Natural resources historically defined the development and expansion of Arizona's economy; hence the proverbial Five C's. But natural resources in the future will define limitations as well as opportunities, and human resources will become increasingly important. Defining limitations are resources such as minerals, water and agricultural land. Minerals, a nonrenewable resource, provide little new economic opportunity. Water, a renewable resource currently in adequate aggregate supply, represents a constraint in that this resource must be guarded, and continued investment is needed to ensure adequate distribution and quality.

Agricultural land is a diminishing resource as urban uses expand. Thus, this resource is also constrained, although soil conservation and improved technology regarding soil preparation and irrigation still offer potential for greater use of this resource.

Forests are renewable resources that do offer development potential. Recent forest management practices have limited the commercial use of forests, yet they hold much potential for sustainable harvests. Moreover, the severity of recent forest fires is driving policy discussions toward new management practices.

Arizona's warm dry climate is a natural resource that will continue to support the economy. Its only constraint is its quality. Thus, measures to improve air quality will be increasingly important as the economy expands. Most of the air pollution in the Phoenix area is the result of the use of automobiles according to the U.S. Department of Energy's Office of Science. The DOE's Pacific Northwest National Laboratory currently is collaborating with local researchers to study the special characteristics of auto emissions in a warm desert environment.

Topography is another natural resource that supports the state's economy. Its varied nature ranges from the Grand Canyon and the Colorado River to the mountains of central and southeast Arizona to the lovely desert environments typified by Saguaro National Park and Organ Pipe Cactus National Monument in the south. The varied topography provides a natural backdrop for continued development of tourist resources, both for visitors as well as for Arizonans and greatly adds to the state's quality of life.

Increasingly, however, it is human or cultural resources that will define Arizona's future. As economic use of natural resources becomes constrained, the economy will become increasingly dependent upon its human capital. This includes the improvement of the quality of the workforce statewide through education, training and investment. But it also means increasing the development and use of Arizona's cultural resources. It means building upon the cultural history of the state's vast

Native American and Latino populations. And it also means further developing the broad cultural amenities of the urban areas so that workforce migrants not only come to take advantage of employment opportunities, but decide to stay over the long term because of a broadening range of factors that contribute to quality of life.

Geographic location is not a positive factor for Arizona's economy. In terms of tourism, Arizona is indeed a destination, but in terms of commerce, it is in many ways more of a waystation between southern California and Texas rather than as a node or a hub. The development of Phoenix as an air hub, however, does offset the disadvantage of the state's location and offers potential for Phoenix's emergence as a regional financial and business center for the Southwest. And the expansion of the southern California economy toward the east provides some advantages going forward as the distance from the Arizona economy is reduced.

Further improvements of trade links to Mexico would help redefine Arizona as a hub, and as an integral part of the CANAMEX region. A completed CANAMEX highway would create a true north-south link that currently lacks in Arizona's transportation system. Finally, the expansion of the southern California economy eastward diminishes the economic distance between that vast economy and Arizona, further minimizing the disadvantages of geographic location.

Not only are distances great to other population centers in the U.S. and Mexico, but Arizona's topography has a tendency to separate rather than unify the state's economy. This is particularly true for the Grand Canyon region and northeastern Arizona.

Public Services. A primary service of state and local government is police protection. This factor is important since Economy.com's research indicates that the crime rates do influence location decisions of industry. Overall, Arizona provides police protection at a rate near the U.S. average. According to Bureau of Justice Statistics, the number of full-time sworn officers in Arizona law enforcement agencies amounted to 23 per 10,000 population in 1996.¹⁷ This is near the national average of 25. True to Arizona's home rule tradition, law enforcement is concentrated within local government. The rate of full-time officers in local police departments amounts to 16 officers per 10,000 population, just ahead of the national average of 15. Arizona ranks 21st among states for the rate of total sworn officers and 9th for the rate of local officers per capita. While quantity is not a complete measure of police services, it may indicate that Arizona's above average crime rate is not due to a lack of uniformed police officers.

4.3.3 Health, Poverty and Crime

Health, welfare and crime are important measurements of quality of life. As such, good health and welfare and low crime rates are considerable comparative advantages for attracting and retaining employers and workers. They also are advantages in terms of keeping costs of living and costs of doing business down. The less government must pay for public health and welfare services and police protection, the easier it is to maintain a manageable tax rate. Similarly, insurance rates for health and property for both households and their employers fall when rates of crime or illness fall.

¹⁷ Source: Morgan, Kathleen O'Leary and Scott Morgan, eds., *Crime State Rankings 2002, Crime in the 50 United States*, Morgan Quinto Press, 2002. Latest data is for 1996.

Table 8: Health Indicators

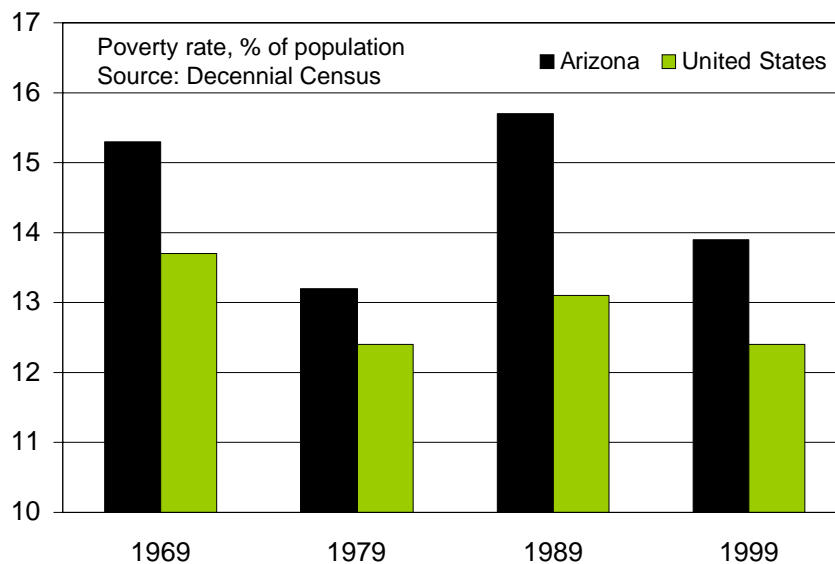
State	Per capita health spending, 1998	Rank	ER visits per 1,000 pop.	Rank	Infant deaths per 1,000 live births	Rank	Death rate per 100,000	Rank	Heart attack deaths per 100,000	Rank	Cancer deaths per 100,000	Rank
Alabama	3,825	21	466	10	9.8	4	1,021	4	310	6	213	16
Alaska	3,681	26	296	47	5.7	44	834	37	198	48	187	45
Arizona	3,042	46	311	41	6.8	28	850	30	233	37	188	43
Arkansas	3,320	41	449	11	8.0	14	1,005	7	299	10	221	8
California	3,305	42	280	50	5.4	47	791	49	256	26	183	47
Colorado	3,468	35	330	37	6.7	31	801	46	170	48	170	49
Connecticut	4,639	5	399	21	6.1	40	792	47	242	33	195	38
Delaware	3,978	13	365	29	7.4	19	905	22	278	20	231	4
District of Columbia	8,327	1	562	2	15.0	1	1,083	1	296	11	237	1
Florida	4,085	9	400	19	7.4	19	834	37	256	26	196	36
Georgia	3,570	31	403	18	8.2	11	984	11	291	13	207	27
Hawaii	3,969	15	221	51	7.0	25	680	51	202	47	155	51
Idaho	2,673	51	326	39	6.7	31	825	39	222	43	187	45
Illinois	3,604	28	366	28	8.5	8	903	23	280	19	211	20
Indiana	3,642	27	376	24	8.0	14	941	15	286	16	219	9
Iowa	3,600	30	367	27	5.7	44	815	43	246	30	191	41
Kansas	3,602	29	344	35	7.3	22	851	29	240	34	193	39
Kentucky	3,747	24	497	6	7.6	18	1,013	5	316	4	226	5
Louisiana	3,850	20	509	5	9.2	5	1,041	3	312	5	234	2
Maine	3,901	17	534	3	4.8	50	896	24	250	28	223	7
Maryland	3,903	16	346	33	8.4	10	911	17	263	24	212	19
Massachusetts	4,920	2	435	13	5.2	48	817	41	230	24	208	25
Michigan	3,550	33	373	26	8.1	13	907	20	292	12	204	28
Minnesota	4,205	7	304	43	6.2	38	792	47	196	50	189	42
Mississippi	3,235	43	533	4	10.1	3	1,065	2	358	1	232	3
Missouri	3,869	19	422	15	7.8	16	954	13	306	9	211	20
Montana	3,085	45	310	42	6.7	31	861	27	216	45	196	36
Nebraska	3,570	31	303	44	6.8	28	839	32	239	35	192	40
Nevada	3,016	47	288	48	6.6	36	967	12	284	18	215	13
New Hampshire	3,805	22	424	14	5.8	41	835	36	244	32	211	20
New Jersey	4,043	10	345	34	6.7	31	858	28	273	22	211	20
New Mexico	2,929	48	298	45	6.9	26	876	41	229	41	180	48
New York	4,661	4	396	22	6.4	37	836	35	308	8	198	31
North Carolina	3,699	25	400	19	9.1	6	944	14	266	23	210	24
North Dakota	4,177	8	413	16	6.8	28	803	45	237	36	188	43
Ohio	3,800	23	445	12	8.2	11	934	16	288	14	216	11
Oklahoma	3,388	38	347	32	8.5	8	985	10	319	3	208	25
Oregon	3,234	44	297	46	5.8	41	839	32	209	46	198	31
Pennsylvania	4,311	6	395	23	7.3	22	908	19	287	15	213	16
Rhode Island	4,668	3	471	8	5.7	44	813	44	246	30	214	14
South Carolina	3,436	36	486	7	10.2	2	996	9	285	17	216	11
South Dakota	3,998	12	282	49	8.9	7	820	40	233	37	201	29
Tennessee	3,975	14	468	9	7.7	17	1,002	8	309	7	219	9
Texas	3,401	37	359	31	6.2	38	892	25	275	21	197	35
Utah	2,832	50	317	40	4.8	50	787	50	192	51	157	50
Vermont	3,486	34	375	25	5.8	41	844	31	227	42	213	16
Virginia	3,360	40	360	30	7.3	22	906	21	258	25	214	14
Washington	3,370	39	332	36	5.0	49	816	42	218	44	199	30
West Virginia	4,027	11	567	1	7.4	19	1,013	5	327	2	226	5
Wisconsin	3,892	18	330	37	6.7	31	838	34	247	29	198	31
Wyoming	2,916	49	408	17	6.9	26	909	18	233	37	198	31
United States	3,750		374		7.1			882		270		203

Source: American Hospital Association; Center for Medicare and Medicaid Services; Centers for Disease Control
Note: Spending includes public and private

Health. By a number of quantitative indicators, residents in Arizona are healthier than their peers elsewhere in the nation. Arizona has below-average infant mortality and death rates, and ranks among the lowest of the states in terms of heart attack and cancer death rates (see Table 8). Health service utilization is extremely low in Arizona, with the number of admissions and ER visits per capita in Arizona well below the national average (see Table 9). It is difficult to know, however, whether the low number of admissions or ER visits is a factor of good health, or a factor of access to such facilities.

Poverty. Over the past thirty years, the poverty rate in Arizona has changed little according to the decennial census, fluctuating between approximately 13% and 16% since 1969 (see Chart 37). Over this period, Arizona's poverty rate has remained above the U.S. average. The 2000 census indicates some improvement from the wide gap ten years earlier, however, and the 1999 gap of 1.5 percentage points is about at its average since 1969.

Chart 37: Poverty Rate Changes Little



A rate consistently higher than average is due to a complex set of factors. The poverty rate remains persistently high among some of Arizona's more remote counties where economic opportunities are limited. For example, while every county's poverty rate improved between 1989 and 1999, the rates for Apache and Navajo counties remained at 30% or above in 1999 (see Table 9). Second, the stream of international immigrants likely generates a stream of new residents living under the poverty line, effectively replacing long-term immigrant households that may be pulling themselves out of poverty. Thus, the rather static measure of the poverty rate is sure to miss the dynamics of poverty over time for individual immigrant households that improve their economic wellbeing over time. From a policy point of view, however, there appears to be a rather consistent share of the population living in poverty at any one time that will need health and welfare services. Moreover, Arizona's rate of teen pregnancy, a measure sometimes associated with poverty, is among the highest nationwide (see Table 10).

Crime. A high crime rate is of similar concern. According to the FBI crime index Arizona had the second highest crime rate in the nation in 2000 (see Table 10).¹⁸ Moreover, the state has ranked among the top five nearly every year since the FBI began the Uniform Crime Reporting program in 1974. Furthermore, Maricopa and Pima counties

¹⁸ The FBI crime index total is the sum of selected offenses used to gauge fluctuations in the overall volume and rate of crime reported to law enforcement. The offenses included in the crime index total are the violent crimes of murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault, and the property crimes of burglary, larceny-theft, and motor vehicle theft. Because they are not consistently available, arson figures are not included in the crime index total. The index in this report is on a per capita basis.

Table 9: Population By Poverty Status, 1999 and 1989

	1999 Population for which poverty status has been determined			1989 Population for which poverty status has been determined			Poverty Rate 10-year Change
	Total	In Poverty	Poverty Rate	Total	In Poverty	Poverty Rate	
United States	273,882,232	33,899,812	12.4	241,977,859	31,742,864	13.1	-0.7
Arizona	5,021,238	698,669	13.9	3,584,399	564,362	15.7	-1.8
WACOG	326,696	54,720	16.7	209,194	37,476	17.9	-1.2
La Paz County	19,383	3,798	19.6	13,741	3,875	28.2	-8.6
Mohave County	153,062	21,252	13.9	92,157	13,049	14.2	-0.3
Yuma County	154,251	29,670	19.2	103,296	20,552	19.9	-0.7
NACOG	440,035	94,013	21.4	332,719	90,211	27.1	-5.7
Apache County	68,212	25,798	37.8	60,836	28,640	47.1	-9.3
Coconino County	113,076	20,609	18.2	90,177	20,805	23.1	-4.9
Navajo County	95,084	28,054	29.5	76,251	26,458	34.7	-5.2
Yavapai County	163,663	19,552	11.9	105,455	14,308	13.6	-1.7
MAG							
Maricopa County	3,027,299	355,668	11.7	2,087,745	257,359	12.3	-0.6
CAAG	214,771	36,568	17.0	150,240	33,386	22.2	-5.2
Gila County	50,265	8,752	17.4	39,496	7,234	18.3	-0.9
Pinal County	164,506	27,816	16.9	110,744	26,152	23.6	-6.7
PAG							
Pima County	823,638	120,778	14.7	650,384	111,880	17.2	-2.5
SEAGO	188,799	36,922	19.6	154,117	34,050	22.1	-2.5
Cochise County	111,867	19,772	17.7	92,172	18,721	20.3	-2.6
Graham County	30,242	6,952	23.0	24,438	6,523	26.7	-3.7
Greenlee County	8,475	842	9.9	7,985	1,010	12.6	-2.7
Santa Cruz County	38,215	9,356	24.5	29,522	7,796	26.4	-1.9

Source: Census 2000 Sample Demographic Profiles, Table DP-3; Census 1990 , Table DP-4: Income and Poverty Status in 1989

Table 10: Crime and Human Welfare Indicators

State	Number of crimes per 100,000	Rank	Number of firearm deaths per 100,000	Rank	Number of teen births per 1,000	Rank
Alabama	4.6	16	17.8	5	62.8	9
Alaska	4.3	23	16.0	8	41.8	31
Arizona	5.8	2	17.7	6	69.6	4
Arkansas	4.1	24	15.4	10	68.1	5
California	3.7	31	9.3	35	50.7	20
Colorado	4.0	29	11.3	25	48.4	22
Connecticut	3.2	36	6.2	44	33.3	44
Delaware	4.5	18	9.0	37	54.3	16
District of Columbia	7.3	1	32.3	1	83.5	1
Florida	5.7	3	11.2	26	53.5	17
Georgia	4.8	14	14.2	13	65.1	7
Hawaii	5.2	7	3.7	50	43.8	27
Idaho	3.2	39	12.4	21	43.7	28
Illinois	4.3	21	10.0	31	51.1	19
Indiana	3.8	30	11.4	24	51.6	18
Iowa	3.2	37	6.9	43	35.8	41
Kansas	4.4	20	10.1	30	47.4	24
Kentucky	3.0	46	13.1	18	56.4	15
Louisiana	5.4	5	17.9	4	62.8	9
Maine	2.6	47	8.7	39	29.8	47
Maryland	4.8	13	12.8	20	42.6	30
Massachusetts	3.0	42	3.2	51	28.7	48
Michigan	4.1	25	11.0	27	40.5	32
Minnesota	3.5	33	6.2	44	30.0	46
Mississippi	4.0	28	18.6	3	72.5	2
Missouri	4.5	17	13.0	19	49.6	21
Montana	3.5	32	13.6	16	35.1	43
Nebraska	4.1	26	8.8	38	37.0	38
Nevada	4.3	22	21.6	2	64.1	8
New Hampshire	2.4	49	6.0	46	24.0	51
New Jersey	3.2	40	4.5	49	32.8	45
New Mexico	5.5	4	17.0	7	67.4	6
New York	3.1	41	5.6	48	37.0	38
North Carolina	4.9	10	13.8	15	59.5	14
North Dakota	2.3	51	7.5	42	27.7	49
Ohio	4.0	27	8.3	41	46.0	26
Oklahoma	4.6	15	15.4	10	60.5	13
Oregon	4.9	12	11.6	23	46.5	25
Pennsylvania	3.0	44	9.9	32	36.2	40
Rhode Island	3.5	34	5.7	47	38.2	36
South Carolina	5.2	6	14.1	14	60.8	12
South Dakota	2.3	50	9.9	32	37.6	37
Tennessee	4.9	11	15.3	12	62.7	11
Texas	5.0	9	11.0	27	70.1	3
Utah	4.5	19	9.9	32	40.2	34
Vermont	3.0	45	9.3	35	25.7	50
Virginia	3.0	43	12.0	22	42.7	29
Washington	5.1	8	10.2	29	40.1	35
West Virginia	2.6	48	13.3	17	47.9	23
Wisconsin	3.2	38	8.4	40	35.7	42
Wyoming	3.3	35	15.5	9	40.4	33
United States	4.12		10.6		49.6	

Source: FBI; Census Bureau; Centers for Disease Control

consistently reported the highest crime rates within the state. Similarly, the state ranked fourth in the nation in 2000 in terms of number of deaths by firearms per capita according to the Centers for Disease Control.

4.3.4. Demographics

Population. Population growth in 2001 of 2.8% was well below the state's average of 3.4% that prevailed over the past decade. But Arizona's population growth has had a very procyclical nature to it, remaining generally in the high 3% range during periods of U.S. economic expansion, and falling to under 3% during periods of recession. During the most recent business cycle, population growth accelerated to a peak of 4.4% during the mid-1990s, which corresponded to the state's peak job growth rate.

Just as population growth varies from year to year with economic trends, the rate of growth has varied over the past decades (see Chart 38). But Arizona consistently outpaces the U.S. Over the past 40 years, Arizona's population growth rate has averaged 3.5% per year, outpacing the U.S. rate by 2.4 percentage points. Thus, while population growth varied during the 1990s, its growth rate for the entire decade of 3.4% nearly matches its long-term trend, and its lead over the U.S. is just slightly under its long-term trend (see Table 11).

Chart 38: Rapid Population Growth

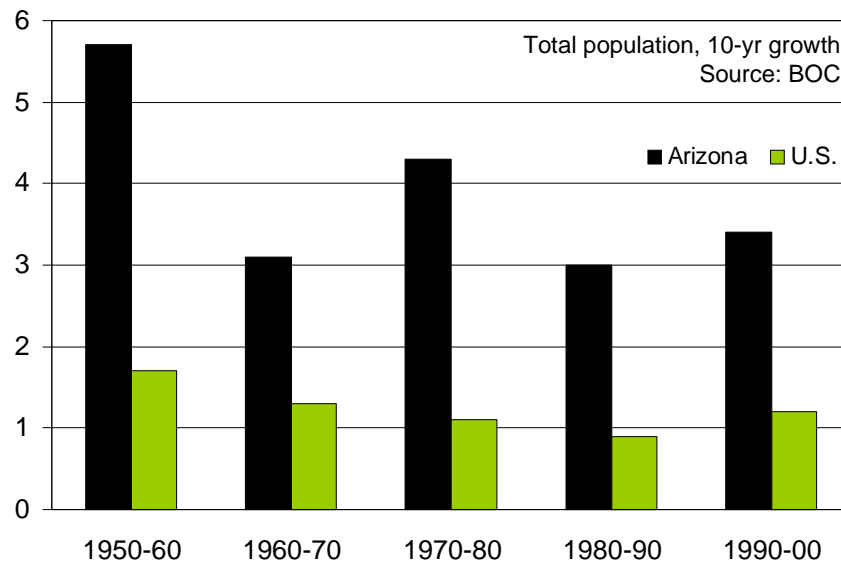


Table 11: Population Growth Rates By Decade

Arizona and U.S.

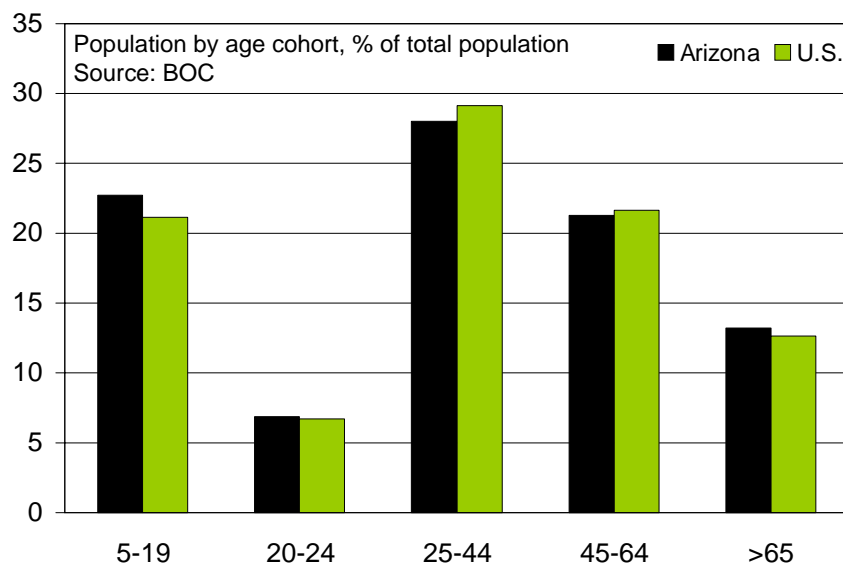
	Arizona	U.S.	Difference
1950-1960	5.7	1.7	4.0
1960-1970	3.1	1.3	1.8
1970-1980	4.3	1.1	3.2
1980-1990	3.0	0.9	2.1
1990-2000	3.4	1.2	2.2
1950-2000	3.9	1.2	2.7
1960-2000	3.5	1.1	2.4

Source: Bureau of Census

The next ten years are expected to diverge somewhat from the past. Economy.com expects population growth during the coming ten years ending in 2012 to be a more moderate 2.6% average annual rate.¹⁹ It will remain well above average, remaining 1.7 percentage points above average, but this too is narrower than in past decades. A narrowing of regional economic differences and some potential for a leveling off or moderate slowdown in both domestic and international migration underlie these projections. While slower than historical patterns, the projected rates will be strong enough to maintain the ranking of number two, just behind Nevada, that Arizona has maintained nearly every year for the past 40 years. Thus, Arizona will still maintain a strong comparative advantage in terms of its ability to attract workforce migrants, thereby supplementing the quality of the workforce, and its ability to attract retiree migrants, thereby supplementing the wealth, income stream and spending patterns of the overall population.

Aside from its rapid growth, Arizona's demographic trends are characterized by its age structure (see Chart 39). Arizona's population is biased toward age cohorts younger than 20. This is partly due to higher birth rates among recent immigrant households from Mexico. While migrants under the age of 19 do not make up an unusually large share of the total number of immigrants, immigrant households tend to have larger and younger families, contributing to the native-born young population. The age structure is also supported by a high birth rate among Native American families.

Chart 39: Age Structure Of Population



Retiree migration also drives the 65+ age cohort slightly higher than the national average, although the difference is less significant than the younger age cohort. Over the past 20 years (indeed for the past 50 years), the share of the U.S. population over 65 years of age has increased with rising life expectancy. Its share rose from 11.3% in 1980 to its current 12.4%. This shift has occurred just slightly faster in Arizona, rising from 11.4% to 13.0% over the same period. The difference is not great, but does illustrate the influence of retiree migration.

The age distribution distorts measures of productivity for the state if measured on a per capita basis; Arizona ranks well below the median of all states at 35th, with per capita gross output of \$30,700 in 2001. However, the productivity of the workforce

¹⁹ This is identical to the projection of Arizona State University's Center for Business Research that was done earlier this year for the Statewide Economic Study.

is nearly equal to the median. Output per payroll worker of \$71,900 ranks the state right in the middle at 24th.²⁰ So while the workforce is productive, the age distribution implies a continuing burden of providing services to the general population, particularly education and social services to the younger cohorts that pay few if any taxes directly.

The racial composition of Arizona is more diverse than the nation as a whole. Just over 30% of Arizona's population is comprised of minority groups, above the 27% national share. Its ethnic composition also differs significantly from the national profile. Arizona has a much higher share of Hispanics and Native Americans than the rest of the nation while it lags the nation in the share of black and Asian residents among its population (see Chart 40). Arizona's share of Hispanic residents, who cut across racial groups, is over twice the national average. The Hispanic population was the fastest growing minority group during the 1990s, although Asian and black populations also rose rapidly. The Native American population also increased, but more slowly (see Chart 41). The shifting composition of the population is indicative

Chart 40: Minority Distribution of Population

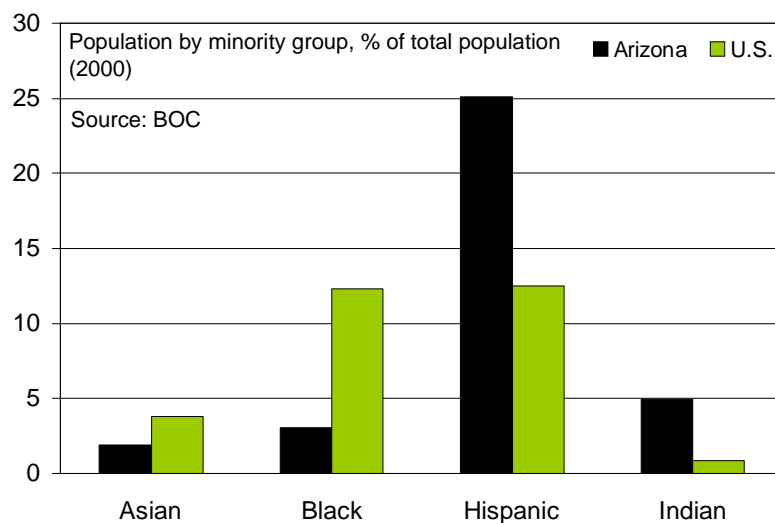
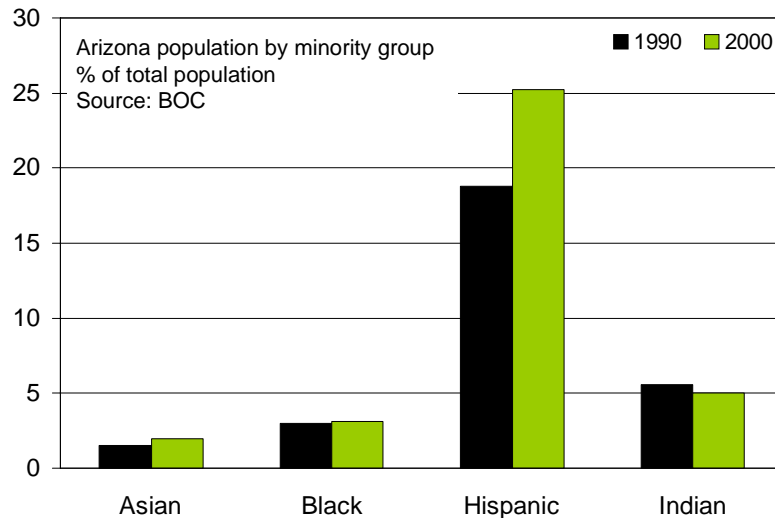


Chart 41: Minority Population Shares, 1990 and 2000



²⁰ It should be noted that output per worker is below the average of \$77,200 for the U.S. The national average is driven upward by high productivity in several large states such as California, New York, New Jersey and Massachusetts.

of the changing nature of the state's workforce and the constant need to shape education and workforce development programs to the current economic and demographic environment.

While all regions of Arizona enjoy positive population growth, the rate of growth is not evenly distributed. WACOG has the highest population growth rate, while SEAGO has the lowest rate in the state, but all of Arizona's COGs grew at a pace well above the national average over the past decade. Aside from WACOG, CAAG and MAG grew faster than the statewide average (see Chart 42).

Migration patterns help determine the distribution of population growth, with WACOG and CAAG having the largest impact from migration, while SEAGO has the least (see Chart 43). Retiree migration explains only part of the migration pattern. Indeed, WACOG and CAAG have the highest share of residents aged 65 and over and have the highest migration rates. Yet MAG has a migration rate about equal to the statewide average, but it has a younger age distribution (see Chart 44). Clearly, MAG's migration is workforce driven rather than retiree driven.

Chart 42: Population Growth by Region

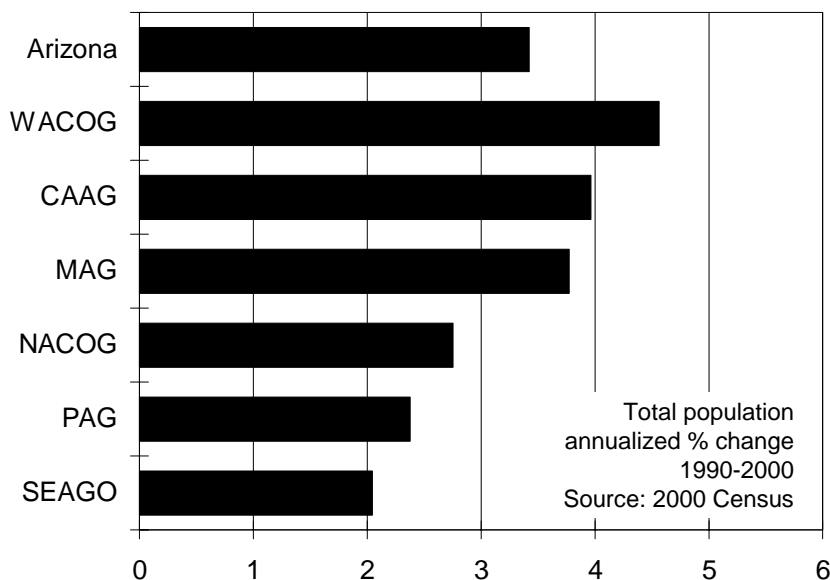


Chart 43: Net Migration Contribution to Population Change

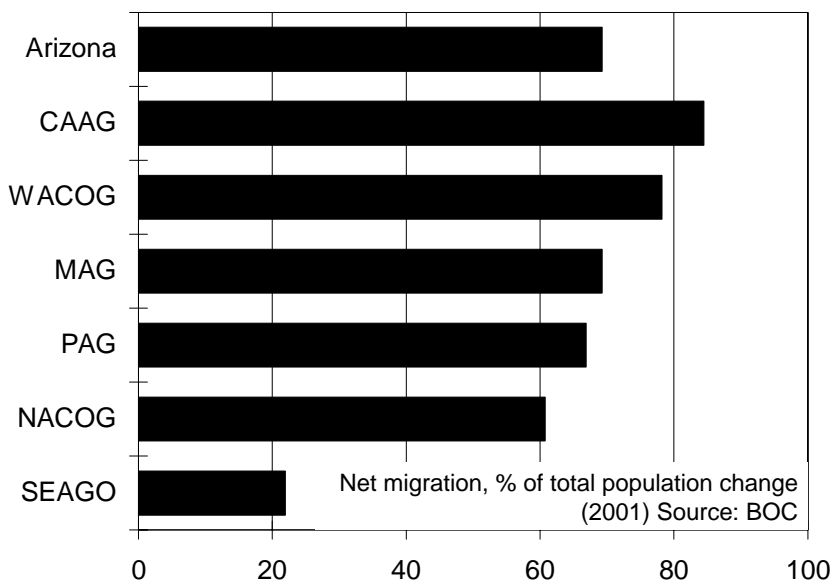
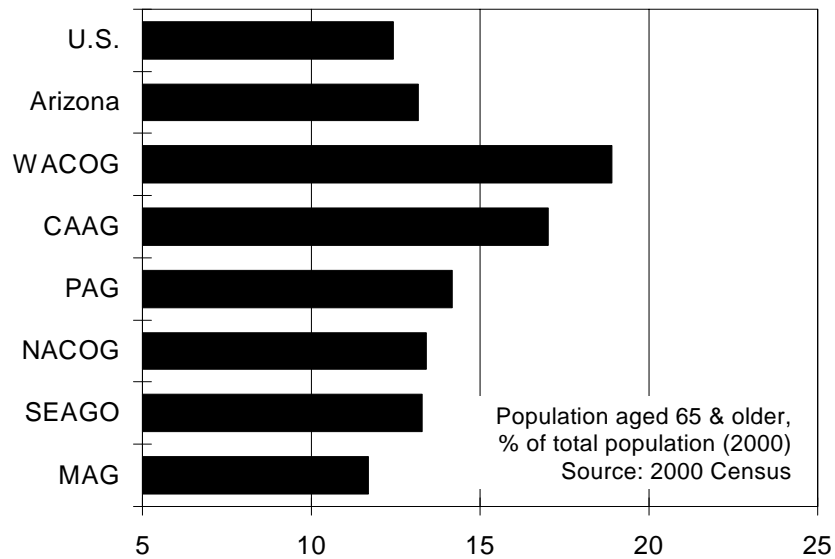
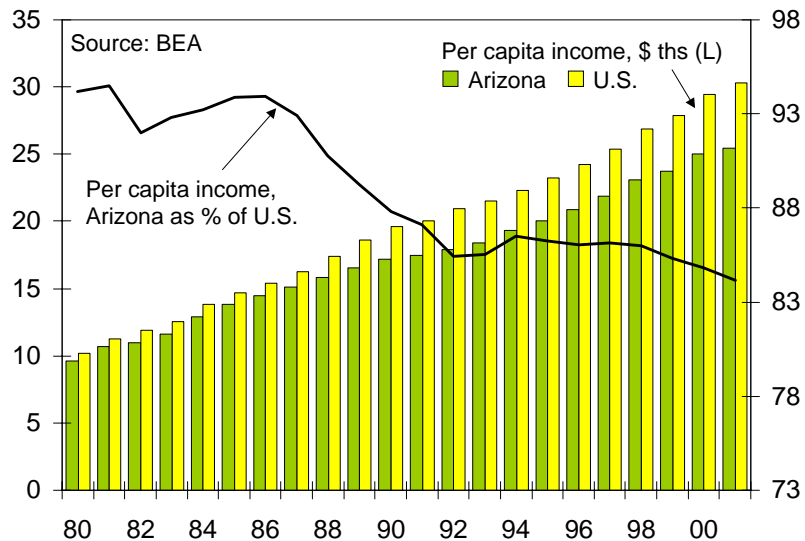


Chart 44: Population Share Over 65 Years Old



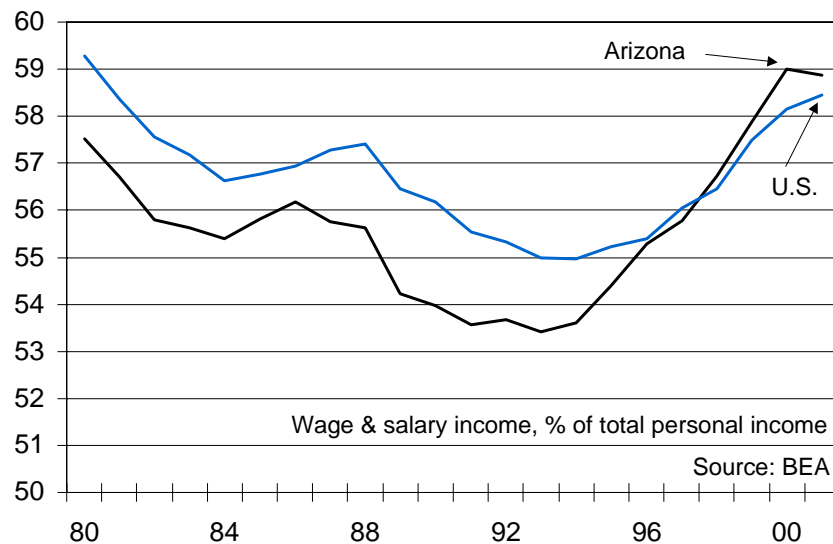
Composition of Income. Per capita income in Arizona is below the U.S. average, and the situation has remained fairly constant over the past decade (see Chart 45).²¹ But the composition of income is changing as wage and salary income constitutes an increasing share of total personal income (see Chart 46). Since the late 1990s the share of income derived from wages and salaries has exceeded the national share. This indicates that internally generated income, as opposed to pension, investment or other sources of income, is increasingly supporting total personal income. Indeed, total transfer payments from private and government sources fell from an all-time high of 15.6% of total personal income in 1993 to 13% in 2000, falling back nearly to the U.S. average for the first time since 1988. This belies the impression that Arizona relies highly on pension income and transfers to support statewide income.

Chart 45: Per Capita Income Gap Widens



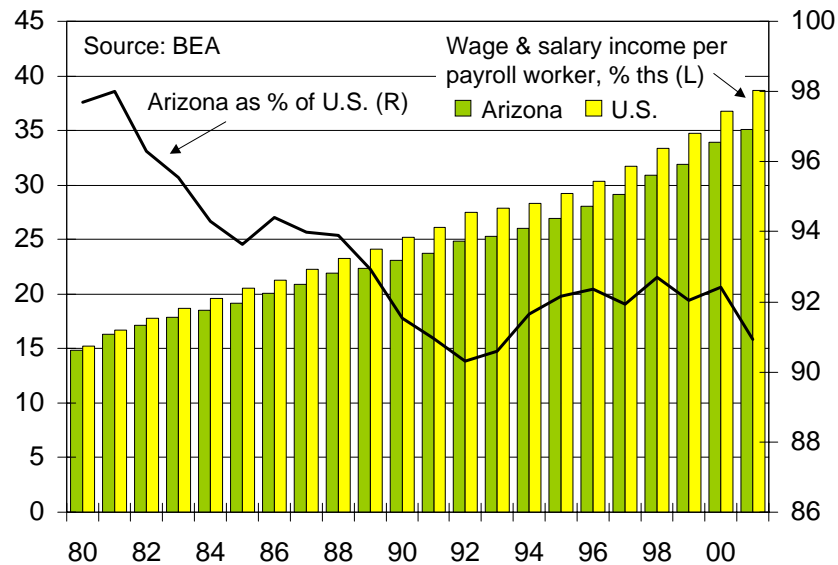
²¹ It is interesting to note that per capita income in Arizona as reported in 1989 and 1999 from the Census Bureau rose slightly from 93% to 94% of the U.S. average, while annual estimates of per capita personal income from the Bureau of Economic Analysis report a drop from 89% to 84% for the same years. Census income is consistently smaller than the BEA estimated income. Census income for 1999 is \$20,275; the BEA estimate is \$23,755. The BEA figure includes estimates of non-cash income such as medical and life insurance benefits, the imputed value of housing rental accrued to homeowners, and other estimates of non-cash income.

Chart 46: Wage and Salary Income Increasingly Important



Wage rates in Arizona are indeed below the national average, however (see Chart 47). Yet between 1992 and 2000 wage rates did not lose ground versus the national average, remaining at about 92%. With aggregate income increasingly dependent upon wages and salaries, rising workforce productivity will be critical to raising wage rates, and thus total personal income. Workforce productivity, in turn, can be raised

Chart 47: Wage and Salary Income Per Payroll Worker

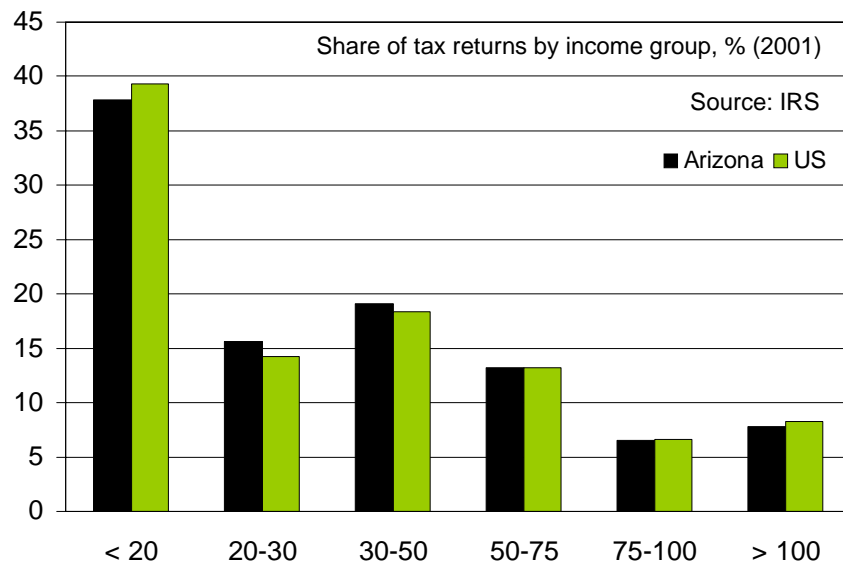


either by developing the region's stock of human capital through education and training programs, or through investment in physical capital.

In the aggregate, income is more equally distributed among income groups in Arizona than nationwide (see Chart 48). A smaller share of tax returns to the IRS reports an adjusted gross income of less than \$20,000. Similarly, a smaller share also reports an AGI of greater than \$100,000. There is a higher concentration of returns near the median range of \$30,000 to \$50,000.²²

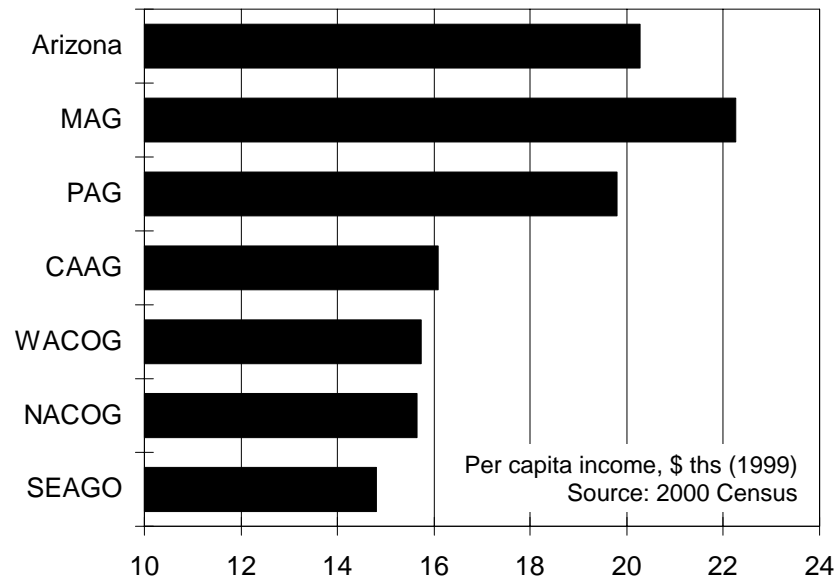
²² Median household income in Arizona was \$40,600 in 1999 according to the 2000 census.

Chart 48: Income Distribution More Evenly Distributed



Income inequalities are more pronounced when looking at income distribution across Arizona's regions. The MAG area is the only one with per capita income above the statewide average (see Chart 49). PAG is right at average. All other regions within the state are below the state average, with the lowest income in SEAGO, according to the 2000 census.²³

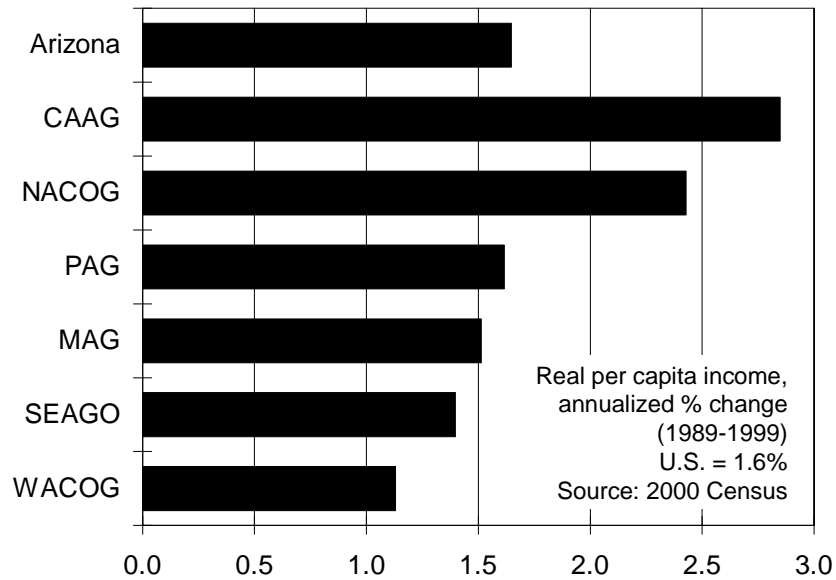
Chart 49: Per Capita Income by Region



²³ BEA estimates rank CAAG as the lowest per capita income.

The census reports that regional income inequalities are improving somewhat. During the 1989-1999 period, the CAAG and NACOG regions registered the fastest growth in per capita income (see Chart 50). Income growth in SEAGO and WACOG, however, had the slowest income growth.

Chart 50: Real Regional Per Capita Income Growth



4.3.5. Credit Quality and Household Balance Sheets

Financial conditions are a final set of factors of comparative advantage going forward. Solid credit quality and balance sheets indicate that an economy is able to withstand periods of downturn or slow growth and maintain a steadier pace. Also, the less need to repair balance sheets over time, the greater can be the impact of wage or income growth because it may be more freely spent and thus circulate back into the economy.

Credit quality. Arizona's credit quality is in fairly good shape. As indicated by the delinquency rate of mortgages in the state, credit quality has deteriorated somewhat as the economy has slowed (see Chart 51). But the mortgage delinquency rate remains well below the rate seen in the late 1980s and early 1990s during Arizona's last recession. Delinquencies on consumer credit also have risen only moderately and are equal to the national average.

Household balance sheets. Household balance sheets in Arizona appear to be in good shape (see Chart 52). Data go back only to 1987 and show an economy worsening at that time as it entered recession, with a bankruptcy filing rate well above average. Since the mid-1990s, however, the state's rate of filings has remained on par with the U.S. The overall rate of filings rose again sharply in 1997, but that was due more to changes in federal bankruptcy filing laws rather than economic conditions. Recent quarters again show a rise in filings due to the 2001 recession in Arizona and nationwide. It is significant to note that, in sharp contrast to a decade ago, filings are remaining very close to the national average. Thus, Arizona does not face the same disadvantage of a decade ago when Arizonans had a disproportionate burden of having to repair their balance sheets before they could resume past spending patterns. The pattern for business bankruptcies is very much the same, remaining very close to the U.S. average over the past year.

Chart 51: Credit Quality Worsening Moderately

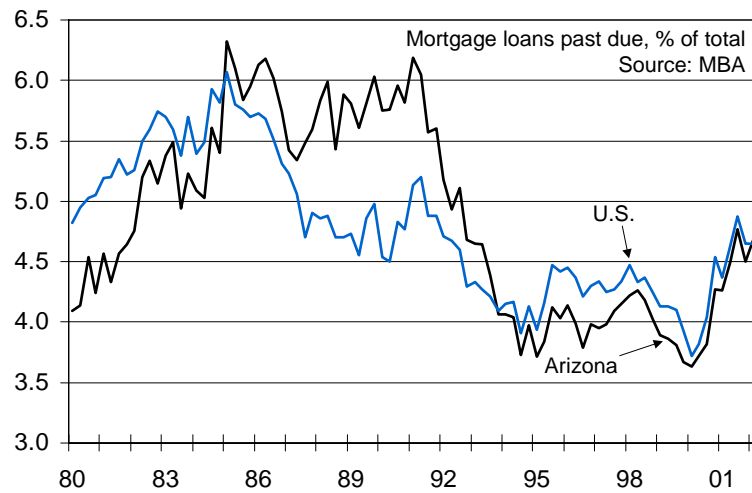
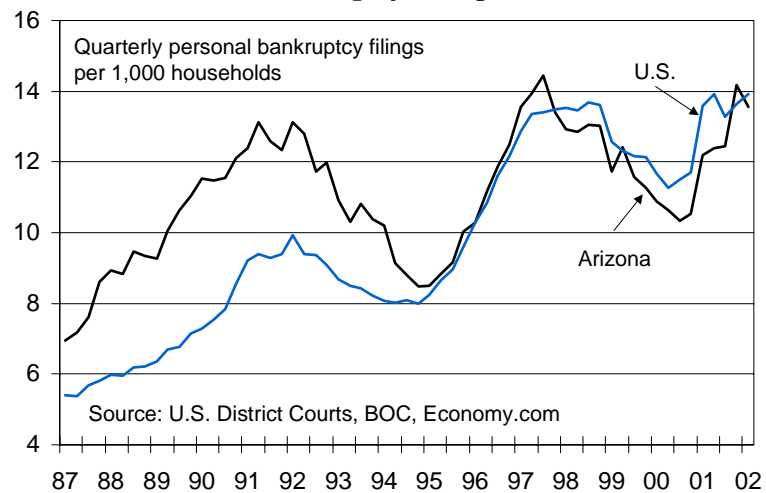


Chart 52: Personal Bankruptcy Filings Per 1,000 Households



5. Economic Opportunities

Future opportunities for economic development include a mix of those industries that already drive the state's economy, and others in which their roles may be enhanced. A three-step process led to the creation of priority economic opportunities. First is Economy.com's forecasts of industry employment over the coming ten years, which provide a rank of growth rates across all two-digit industries as defined by SIC codes.

Second are results from Economy.com's econometric analysis of the comparative advantages that contribute to the determination of industry location. Using the coefficients from the equations estimated for each industry, a calculation was made of the estimated growth potential by industry in Arizona, which was then compared with actual performance over the past ten years. The difference between potential and actual growth provided a ranking of industries in which full potential is not yet realized given current measures of comparative advantage. This, however, is a backward look at the economy. The rankings emerging from this analysis were then combined with the ranking of industries according to the national outlook by industry, weighting these two factors equally.

Finally, from the ranking of industries that emerged from these criteria, industries were selected that had qualities fundamental to the assumptions of the changing macro and international economic environment (see Table 12). These include industries that have more than one of the following qualities: Technology based – an industry that either uses or produces emerging technology; Highly productive – output per worker is above average; High Wages – it generally follows that highly productive industries pay high wages; Research intensive – an industry that contributes to continual creation of new products so as to maintain competitiveness; Export links – an industry whose products have increasing potential for export markets; Existing resources – industries that are firmly supported by endogenous but underutilized local resources and are consistent with Arizona's diverse regional economies; Foundational support – an industry that not only has potential to take advantage of broad national and international markets, but can provide some fundamental support for the state's socio-economic structure.

Table 12: Economic Opportunities

	Economic Opportunity	Opportunity Factors						
		Tech. Based	High Productivity	High Wage	Research Intensive	Export Links	Existing Resource	Foundational Support
1	Software	x	x	x	x	x	o	
2	Health Care/Biotech	x	x	x	x	o	x	x
3	Industrial Machinery	x	o	x		o		
4	Communications Services	x	o	x		o	x	x
5	High-tech Instruments	x	x	x	x	x	x	
6	Forest Products	o			x		x	
7	Research & Testing	x	x	x	x			
8	Transportation/Logistics	o				o	o	x
9	Ag./Food Processing/Ag. Technology	x			o	x	x	
10	Defense/Aerospace/Avionics	x	x	x	x	x	x	

x = Existing

o = Emerging

It should be noted that the industries emerging from this analysis are similar, but not identical to work done by other studies on the Arizona economy and its metro areas. For example, the Greater Phoenix Economic Council has identified a list of twelve industries for expansion in the Phoenix area. In addition to the industries of this study, GPEC identifies environmental technology, electronics, plastics and composites, tourism, senior industries, and e-learning. While these all have potential for the region's future economy, there are reasons for their absence from this study due to its methodology and objectives. For example, environmental technology is a broadly defined industry that would fit in a number of the detailed industries analyzed such as industrial equipment, high-tech instruments, and research and testing. Electronics is not projected to be among the more rapidly growing industries nationwide. Plastics and composites is not an underrepresented industry in Arizona's economy today, but indeed, it does have good potential. Tourism, broadly speaking, is an industry that will likely continue to expand without public policy attention. This study took a more focused look at aspects of tourism that can benefit both visitor and resident alike and is addressed in Section 7. Similarly, e-learning is a component of education services that also is discussed as a foundational issue in Section 7. Finally, senior industries is another broadly defined industry that cuts across many of the more detailed industries that this study addresses.

The following sections will describe the economic opportunities for Arizona that have emerged from this analysis. Each section will focus on one industry and will describe the industry, identify the regions in Arizona where the industry has the best opportunities, provide an overview of the long-term outlook for the industry, explain the advantages within Arizona for the industry and outline constraints that may need to be overcome to support the industry.

5.1. Computer Software and Systems

Description. Computer software and systems includes the production and distribution of software and computer systems (see Table 13 for definitions by SIC and NAICS classification). This can include commercial software publishing or consulting work. Indeed, this industry will increasingly become more of a consulting business as firms across all industries outsource this type of work. Opportunities also include Internet systems design and networking, for which there is no specific industry code.

Technology-based industries have been an important driver of Arizona's economy over the past decade, but the focus has been more on hardware than software. Increasingly, hardware production is moving offshore but software production remains a global activity, providing potential links to national and international production processes as well as markets.

Industry Outlook. Consumer demand for desktop PC applications is leveling off, but advancements in set-top boxes, MP3 players and other multimedia integration are just beginning. In addition, the adoption of wireless data services may proceed faster than expected, spurring demand for a whole new class of applications. There are no clear leaders in these segments, leaving opportunities for smaller firms to emerge as market leaders. Commercial demand will also rise for improved security systems and for continual improvements of inventory and product management. The convergence of the Internet and traditional software also provides further potential.

Regional Opportunities. Computer software is an industry that can be disbursed and could be developed in various locations around the state. Software production, however, does tend to cluster in larger metropolitan areas where ideas are

Table 13: Components of Economic Opportunities

Industry		Employment thousands	Average Wage
SIC Definition	NAICS Definition		
Computer Software & Systems Integration Computer & data processing services (SIC 737)	Software publishers (NAICS 511210) Software reproducing (NAICS 334611) Computer systems design & related services (NAICS 5415)	21.9	\$57,980
Healthcare & Biotechnology Health services (SIC 80, excl. 805, 808) Pharmaceutical manufacturing (SIC 283)	Healthcare (NAICS 62, excl. 6216, 623, 624) Medicinal & Botanical manufacturing (NAICS 3254) Genetics research & development laboratories or services (NAICS 541710 part)	126.6	\$42,843
Industrial Machinery Industrial machinery & equipment (SIC 35 excl. SIC 357, 352)	General industrial machinery & equipment, NEC (NAICS 314999) Fabricated metal product manufacturing (NAICS 332) Machinery manufacturing (NAICS 333 excl. 3331) Power, distribution, & specialty transformer manufacturing (NAICS 335311)	8.5	\$62,594
Telecommunications Telephone communications (SIC 481) Communications services, NEC (SIC 489) Communications equipment manufacturing (SIC 366)	Telecommunications (NAICS 5133) Other telecommunications (NAICS 51339) Communications equipment manufacturing (NAICS 3342) Printed circuit assembly manufacturing (NAICS 334418)	20.5	\$57,379
High-Tech Instruments - Optical, Medical & Measuring Instruments Measuring & controlling devices (SIC 382)	Navigational, measuring & control instruments manufacturing (NAICS 3345 excl. 334511) Optical instrument & lens manufacturing (NAICS 333314) Medical equipment & supplies manufacturing (NAICS 3391)	7.7	\$61,489
Medical instruments & supplies (SIC 384) Ophthalmic goods (SIC 385)			
Forest Products Forest products & services (SIC 08) Lumber & wood products (SIC 24)	Forestry & logging (NAICS 113) Wood product manufacturing (NAICS 321) Showcase, partition, shelving & locker manufacturing (NAICS 337215) Wood kitchen cabinet & countertop manufacturing (NAICS 337110) Paper manufacturing (NAICS 322)	12.4	\$30,115
Paper & allied products (SIC 26)			
Engineering Services - Research & Testing services Research & testing services (SIC 873)	Scientific research & development services (NAICS 54171 excl. Biotech) Testing Laboratories (NAICS 541380)	9.8	\$42,817
Transportation and Logistics Railroads (SIC 40) Trucking & warehousing (SIC 42)	Railroads (NAICS 482) Truck transportation (NAICS 484) Couriers & messengers (NAICS 492) Warehousing & storage (NAICS 493) Process, physical distribution & logistics consulting services (NAICS 541614)	30.9	\$33,378
Agriculture, Food Processing & Ag. Technology Agricultural production (SIC 01) Agricultural services (SIC 07) Food & kindred products (SIC 20) Farm & garden machinery (SIC 352)	Crop production (NAICS 111) Support activities for agriculture (& forestry) (NAICS 115) Food manufacturing (NAICS 311) Agriculture, construction, & mining machinery manufacturing (NAICS 3331)	58.1	\$24,855
Defense/Aerospace/Avionics Aircraft & parts (SIC 372) Guided missiles, space vehicles & parts (SIC 376) Search, detection, navigation, guidance, aeronautical & nautical systems & instruments (SIC 381)	Aerospace products & parts manufacturing (NAICS 3364) Search, detection, navigation, guidance, aeronautical & nautical system & instrument manufacturing (NAICS 334511)	30.6	\$72,439

Source: <http://www.census.gov/epcd/www/naics.html>, Arizona State University, Economy.com

easily shared and workers can have easy contact with multiple employers. Moreover, if the industry is located in rural areas, it needs sufficient broadband supply to facilitate communication between worker, employer and market. Furthermore, the increasingly global nature of the industry means that broadband communications links with the rest of the world will be increasingly important. Thus, the MAG, PAG and NACOG regions have the greatest potential for this industry (see Table 14). Communications systems are good, and the University of Arizona and Northern Arizona University each have related research institutes—Center for Management Information at UA and Center for Data Insight at NAU (see Table 15). UA's Center for Management and Information is consistently ranked among the top five according to *U.S. News and World Report*.

Advantages. The current programs at university research institutes are a clear advantage to supporting this industry and growing it endogenously with local talent. Additionally, Arizona's quality of life factors will serve to attract talent from elsewhere. Workers in this industry have proven themselves in the past to be very mobile and attracted to areas with active lifestyles. Furthermore, Arizona's cost of doing business and cost of living are favorable versus other centers of software and systems development such as Silicon Valley and New England. It is technology based and knowledge intensive. The industry has good upside potential for export markets, particularly if U.S. trade negotiators are successful during the so-called Doha round of global trade talks in liberalizing trade for services such as software and data processing.

Constraints. The constraints to the industry are the rather low rates of educational attainment of Arizona's workforce and a lack of venture capital. Arizona has the smallest amount of venture capital investments relative to its size of any of the states with which it competes for technology industries. Thus, unless further VC or other sources of funding become available, it could be difficult to keep expanding software firms in the state. Rapid growth would also depend on continued migration of skilled labor, as well as development of the local workforce.

5.2 Healthcare & Biotechnology

Definition. Healthcare includes a broad range of services of physicians, dentists and other practitioners. In order to truly become a driving industry, however, it also must include hospitals and related research centers that create centers of excellence that serve a broader market than Arizona. Biotechnology is largely a separate industry more closely centered on pure research rather than the application of research. They are combined here for several reasons. First, the two components are usually physically located near one another. Second, support for the industry from research grants, non-profits and government are similar. Indeed, the State of Arizona, local governments and Indian tribes have already shown their willingness to support biotechnology through financial support of the Translational Genomics Research Institute. Thus, biotechnology is more than an economic opportunity; it is now a reality. Yet the broader healthcare industry remains underrepresented within the state economy and is not yet a basic industry in the true sense of the word, but there is opportunity for it to become so.

Industry Outlook. Healthcare utilization nationwide is rising at a robust rate, which bodes well for the hospital and health care provider industry. The aging of the baby boomers, concurrent with a boom in healthcare technology and growing life expectancy, will support consumer demand. This will be particularly true for inpatient hospital stays, which bring in more revenue relative to other services. Per capita spending on health services will rise as a result.

Table 14: Economic Opportunities By Region

		CAAG	MAG	PAG	SEAGO	NACOG	WACOG
	Economic Opportunity						
1	Software		x	x		x	
2	Health Care/Biotech		x	x		x	
3	Industrial Machinery	x			x		x
4	Communications Services		x	x			
5	High-tech Instruments		x	x			
6	Forest Products					x	
7	Engineering Research & Testing		x	x		x	
8	Transportation/Logistics	x		x	x		x
9	Agriculture/Food Processing/Ag. Technology	x			x		x
10	Defense/Aerospace/Avionics		x	x	x		x
Region	Name	Counties					
CAAG	Central Arizona Association of Governments	Gila, Pinal					
MAG	Maricopa Association of Governments	Maricopa					
PAG	Pima Association of Governments	Pima					
SEAGO	Southeastern Arizona Governments Organization	Cochise, Graham, Greenlee, Santa Cruz					
NACOG	Northern Arizona Council of Governments	Apache, Coconino, Navajo, Yavapai					
WACOG	Western Arizona Council of Governments	La Paz, Mohave, Yuma					

Table 15: Research Centers, Institutes and Programs at Arizona Universities

Center Name	University	College/Department
Agriculture and Environmental sciences		
Arid Lands Information Center (ALIC)	UA	Agriculture/OALS
Arizona Earthquake Information Center	NAU	Geology
Arizona Remote Sensing Center	UA	Agriculture/OALS
Centennial Forest	NAU	Environmental Science - Ecosystem Science & Management
Colorado Plateau Cooperative Ecosystem Studies Unit	NAU	Geology
Ecological Restoration Institute	NAU	Environmental Science - College of Ecosystem Science and Management
Environmental Communication Resource Center	NAU	Environmental Science
Environmental Science & Education, Center for	NAU	Environmental Sciences
Environmental Studies, Center for	ASU	Environmental Science
Merriam Powell Center for Environmental Research	NAU	Environmental Sciences
Meteorite Studies, Center for	ASU	Geology
Planet Earth, Institute for Study of	UA	Environmental Sciences
Research Greenhouse	NAU	Biology
Sustainable Environments, Center for	NAU	Environmental Science
Sustainable Technologies, Agribusiness, and Resources Center	ASU	Agriculture/Business
Verde Valley Watershed Research & Education Program	NAU	Environmental Science
Water Resource Research Center	UA	Agriculture/Soil, Water & Environmental Science
Business and Public Policy		
Advanced Database Research Group	UA	Business & Public Administration
Advanced Purchasing Studies, Center for	ASU	Business - Seidman Institute
Advancement of Small Business, Center for the	ASU	Business - Seidman Institute
American Indian Economic Development, Center for	NAU	Business Administration
Arizona Hospitality Research & Resource Center	NAU	Business
Arizona Real Estate Center	ASU	Business - Seidman Institute
Artificial Intelligence Laboratory	AU	Business & Public Administration
Bank One Center for Business Outreach	NAU	Business Administration
Bank One Economic Outlook Center	ASU	Business - Seidman Institute
Berger Entrepreneurship Program	AU	Business & Public Administration
Bureau of Business & Economic Research	NAU	Business Admin.
Business Research, Center for	ASU	Business - Seidman Institute
Cyberspace Policy Research Group	AU	Business & Public Administration
Decision Behavior Laboratory	AU	Business & Public Administration
Economic and Business Research Program	AU	Business & Public Administration
Economic Science Laboratory	AU	Business & Public Administration
Financial System Research, Center for (Study of Finance, Center for)	ASU	Business - Seidman Institute
Hoffman E-Commerce Laboratory	AU	Business & Public Administration
Institute for Local Government	AU	Business & Public Administration
International Management, Institute for	ASU West	Business - School of Management
Karl Eller Center for the Study of the Private Market Economy	UA	Business & Public Administration
L. William Seidman Research Institute	ASU	Business
Management Development, Office of	NAU	Business Admin.
Management of Information, Center for the	UA	Business & Public Administration
Morrison Institute for Public Policy	ASU	Public Programs
Mosaic Institute, The	AU	Business & Public Administration
Non-Profit Leadership and Management, Center for	ASU	Public Programs
Professional Leadership Center	NAU	Business Administration
Rombach Institute on Crime, Delinquency and Corrections	UA	Business & Public Administration/Public Administra
Services Marketing and Management, Center for	ASU	Business - Seidman Institute
Small Business Institute	NAU	Business - College of Business
Southwest Retail Center	UA	Business
Udall Center for Studies in Public Policy	UA	Public Programs
Urban Inquiry, Center for	ASU	Public Programs

Table 15: Research Centers, Institutes and Programs at Arizona Universities (con't)

Center Name	University	College/Department
Education		
Arizona K-12 Center	NAU	Education
Arizona Prevention Resource Center	ASU	Education
Bilingual/Bicultural Education, Center for	ASU	Education
Excellence in Education, Center for	NAU	Education
Higher Education, Center for the Study of	UA	Education/Higher Education
Indian Education, Center for	ASU	Education
Science & Mathematics Learning Center	NAU	Education
Science and Mathematics Education, Center for	UA	Education
Tribal Environmental Professions, Institute for	NAU	Education
Engineering and Physical Sciences		
Advanced Traffic and Logistics Algorithms and Systems (ATLAS)	UA	Engineering & Mines
Arizona Center for Mathematical Sciences	UA	Science/Math
Astronomical Adaptive Optics, Center for	UA	Science/ASTR
Atmospheric Physics, Institute of	UA	Science/Atmospheric Sciences
Data Insight, Center for	NAU	Engineering/Computer science
Electronic Packaging Research, Center for	UA	Engineering & Mines
Engineering Research Center for Environmentally Benign Semiconductor Manufacturing	UA	Engineering & Mines/CHEE
Low-Power Electronics, Center for (UA/ASU Cooperative)	ASU	Engineering and Applied Sciences
Low-Power Electronics, Center for (UA/ASU Cooperative)	UA	Engineering & Mines/ECE
Manufacturing Institute	ASU	Engineering and Applied Sciences
Material Modeling and Computational Mechanics, Center for	UA	Engineering & Mines/CE&EM
Microcontamination Control, Center for	UA	Engineering & Mines/ECE
On-site Wastewater Demonstration Program	NAU	Engineering & Technology
Optical Data Storage Center	UA	Science/Optical Sciences
Research on Education in Science, Mathematics, Engineering and Technology, Center for (CRESMET)	ASU	Engineering and Applied Science, Liberal Arts and Sciences, Business
Solid-State Electronics Research, Center for	ASU	Engineering and Applied Sciences
Solid-State Science, Center for	ASU	Engineering/Physical science
Space Engineering Research Center for Utilization of Local Planetary Resources	UA	Engineering & Mines/AME
Space Imagery Center	UA	Science/Planetary Science
System Science and Engineering Research, Center for	ASU	Engineering and Applied Sciences, Liberal Arts and Sciences
Telecommunications Research Center	ASU	Engineering and Applied Sciences
Life Sciences		
Arizona Arthritis Center	UA	Medicine
Arizona Cancer Center	UA	Medicine
Arizona Center on Aging	UA	Medicine
Arizona Emergency Medicine Research Center (AEMRC)	UA	Medicine
Arizona Poison and Drug Information Center	UA	Pharmacy
Arizona Prevention Center	UA	Public Health
Avian Cognition Laboratory	NAU	Life Sciences
Cancer Research Institute	ASU	Life Sciences
Comparative Medicine, Center for	NAU	Medicine
Consciousness Studies, Center for	UA	Psychology
Early Events in Photosynthesis, Center for the Study of	ASU	Life Sciences
Exercise Physiology Laboratory	NAU	Medicine - Health Professions
Gait Research Laboratory	NAU	Medicine - Health Professions
Gerontology Institute	NAU	Medicine - Health Professions
Health Outcomes and PharmacoEconomic Research, Center for	UA	Pharmacy
Health Psychology Center	NAU	Psychology
Insect Science, Center for	UA	Life Sciences
Mountain States Regional Hemophilia Center	UA	Medicine
Native American Research and Training Center	UA	Medicine/FCM
Neurogenic Communication Disorders, Institute for	UA	Medicine - Public health
Respiratory Sciences Center	UA	Medicine
Sleep Disorders Center	UA	Medicine
Southwest Environmental Health Sciences Center	UA	Pharmacy
Steele Memorial Children's Research Center	UA	Medicine
Toxicology, Center for	UA	Pharmacy
University of Arizona Sarver Heart Center	UA	Medicine
Valley Fever Center for Excellence	UA	Life Sciences

Table 15: Research Centers, Institutes and Programs at Arizona Universities (con't)

Center Name	University	College/Department
Arts and Sciences and Other		
Applied Sociology, Center for	UA	Liberal Arts and Sciences
Archeological Laboratories	NAU	Liberal Arts and Sciences - Anthropology
Arizona Center for Medieval and Renaissance Studies	ASU	Liberal Arts and Sciences
Arts, Institute for Studies in the	ASU	Liberal Arts and Sciences - Fine Arts
Asian Studies, Center for	ASU	Liberal Arts and Sciences
Child Development and Family Studies Center	ASU West	Liberal Arts & Sciences
Children, Youth and Families, Institute for	UA	Liberal Arts and Sciences
East Asian Studies, Center for	UA	Liberal Arts and Sciences
Exercise and Sport Research Institute	ASU	Athletics
Future Work Force Development, Institute for	NAU	Liberal Arts and Sciences
Herberger Center for Design Excellence	ASU	Architecture and Environmental Design
High Altitude Sports Training Center	NAU	Athletics
Hispanic Research Center	ASU	Liberal Arts and Sciences
Hopi Cultural Preservation Office	NAU	Liberal Arts and Sciences - Anthropology
Human Development, Institute for	NAU	Liberal Arts and Sciences
Human Origins, Institute of	ASU	Liberal Arts and Sciences
Innovation in String Music Teaching, Institute for	UA	Liberal Arts and Sciences - Music & Dance
Latin American Area Center	UA	Liberal Arts and Sciences
Latin American Studies, Center for	ASU	Liberal Arts and Sciences
Law, Science and Technology, Center for the Study of	ASU	Law
Learning in Electronic Environments, Center for Research, Development & Assessment of	NAU	Information Technology Services
Lincoln Center for Applied Ethics, Joan and David	ASU	Liberal Arts and Sciences
Martin-Springer Institute for Teaching the Holocaust, Tolerance, and Humanitarian Values	NAU	Liberal Arts and Sciences
Mexican American Studies and Research Center	UA	Liberal Arts and Sciences
Middle Eastern Studies, Center for	UA	Liberal Arts and Sciences
National Center for Interpretation Testing, Research and Policy	UA	Liberal Arts and Sciences
Native Americans, Institute for	NAU	Liberal Arts and Sciences
Native Americans, Institute for	UA	Liberal Arts and Sciences
Navajo Nation Archeology Division	NAU	Liberal Arts and Sciences
Network Operation Center	NAU	Information Technology Services
Peter Triestman Fine Arts Center for New Media	UA	Liberal Arts and Sciences - Fine Arts
Poetry Center	UA	Liberal Arts and Sciences - Humanities
Quaternary Studies Program	NAU	Liberal Arts and Sciences - Archaeology
Roy P. Drachman Institute for Land and Regional Development Studies	UA	Architecture
Social and Behavioral Sciences Research Institute	UA	Liberal Arts and Sciences
Social Research Laboratory	NAU	Liberal Arts and Sciences
Southwest Center	UA	Liberal Arts and Sciences
Southwest Institute for Research on Women (SIROW)	UA	Liberal Arts and Sciences

Technology provides further upside potential for the health services industry. Greater use of the Internet and budding wireless technology would provide significant operational and cost efficiencies. Thus, there are links to computer software and telecommunications industries. More accurate, accessible and standardized information would cut waste, increase consumer choices and improve productivity. Similarly, the continued pace of development of medical technologies offers significant potential for providing more effective care to a larger population. Any unforeseen leap from the drawing board to the marketplace of even one of many promising new technologies would provide significant upside potential for the industry.

It is the advancement in technology and its use that can help turn Arizona's healthcare industry into a basic industry serving a broad regional, national or international market. Thus, R&D and capital improvements linked to its healthcare industry are vital to its future growth.

Regional Opportunities. The state's successful initiative to attract the TGRI provides good potential for the biotech and broader healthcare industries in MAG, PAG and NACOG. TGRI will be physically located in Phoenix but will work closely with all three Arizona Universities. Moreover, UA supports healthcare research through the Arizona Health Sciences Center and its College of Health Outcomes and Pharmaco-economic Research. ASU supports the industry through its Cancer Research Institute, Arizona Prevention Resource Center, and Exercise and Sports Research Institute.

Advantages. The industry is technology based and productive. It has the potential to serve a broad market across the Southwest and northern Mexico. It employs a broad range of workers at various skill levels.

The state's advantages for health care derive from both supply and demand aspects. From a supply point of view, there are broad, and sometimes deep, resources within the university system and public-private ventures that support research and development in the industry. From a demand perspective, the healthcare industry in Arizona remains small in relation to the size of either its population or its workforce. This is indicative of sufficient pent-up local demand, although the pent-up demand is more evident in the smaller counties where it is more difficult to entice high-level medical care services. It is also indicative of the potential to develop the industry into a world-class facility. Furthermore, the approximately \$100 million in research money that TGRI will bring to the state could attract the eye of healthcare and biotech venture capital investors.

Furthermore, in Arizona's more rural regions, there is a lack of sufficient skilled healthcare facilities, which works to detract from their quality of life and their potential to attract a quality workforce. Thus, a possible spin-off of the development of healthcare research and services could be a spreading of the industry out toward the rural regions, particularly if part of the industry's growth includes training more local practitioners and financing more facilities.

Constraints. The direct impact of biotechnology can be limited. For example, by the end of its fifth year, TGRI will employ approximately 275 full time equivalent workers. It is not a labor-intensive activity. But the project also will boost construction activity in Phoenix during these transitional years. Beyond that, the future for biotechnology as a regional development vehicle remains uncertain. Currently, biotech research and venture capital are highly concentrated outside of Arizona; thus the industry still faces a long-term battle to establish itself. Moreover, biotechnology is still not a profitable business in the aggregate, and will probably remain unprofitable for much of the coming decade while the exceptional advances in life sciences discovery are finally transformed into useful and practical applications. So

the biotech industry's medium-term outlook contains much uncertainty and will remain dependent on a steady stream of sponsors.

The broader healthcare industry also is dependent upon continued support of federal and state research and education funding to support university programs and training programs. These programs must address a broad array of needs including research, doctor training, other allied professional training and financing of expensive facilities. Finally, there is a risk that advances in biotech research stay completely independent of healthcare training and research, thus minimizing the potential synergy. Workforce quality, financing and coordination could become key constraints for these activities.

5.3 Industrial Machinery

Definition. The higher wage components of industrial machinery include construction and related machinery, metalworking machinery, special industry machinery such as woodworking and food products machinery and others. It is a broad set of manufacturing industries that increasingly use high-tech equipment in their production processes and serve regional and national markets. This is an industry that has had a difficult time in export markets due to the strong dollar, but the outlook for a weaker dollar will bring back some of its export competitiveness.

Industry outlook. This is an industry with remarkably little presence in any of Arizona's regions. The industry is a broad one and includes anything from engines to machine tools, industrial equipment and computer assembly. The long-run prospects for U.S.-based industrial machinery production are mixed, but export markets will improve with a weakening dollar. Furthermore, productivity growth will support the industry longer term and the tightening of supply-chain management control will keep the industry from abandoning U.S. locations completely for low-cost locations overseas.

Regional opportunities. Given the higher concentration of the industry in southern California, there is potential for western Arizona to capture some of the industry as it seeks lower cost places to set up operations. This will become increasingly critical if power costs continue to rise in California, or if other costs such as workers' compensation or other indirect costs rise further across the state line. Indeed, the industry has already shifted from the major coastal metro areas of California into the Inland Empire. A shift further to the east may be inevitable. SEAGO and CAAG join WACOG as low cost places to operate such facilities with ample workforces. This is an industry that does not have to locate in one of the major metropolitan areas of the Arizona.

Advantages. Arizona's three more rural regions provide cost advantages over neighboring California. These advantages include lower power costs and a potentially more stable source of electric power. The gap in electric power costs may conceivably widen further given that California's re-regulated industry is raising rates while Arizona is still attempting to deregulate the industry. Similarly, workers' compensation costs are driving California manufacturers to seek alternative locations.

While industrial machinery manufacturing increasingly calls for more skilled labor and the use of technology-intensive equipment, the skill levels required are lower than other specialized tech industries. Thus it would be a good match in the more rural COGs where educational attainment is lower than in the central core of the state.

The expected fall in the dollar will increasingly open up export markets to U.S.-made industrial machinery. These goods will be in particular demand in emerging Latin American markets, where the potential for expanded free trade is very good.

Constraints. A major constraint to any manufacturing industry in Arizona is the high tax rate on real and personal property for commercial and industrial establishments. Given that the industry relies on a large amount of capital investment, the tax can be a heavy burden and may offset other cost advantages versus California and elsewhere. Thus, the successful development of this industry would require changes in state tax policy.

Education and training would likely also be critical to the successful attraction of industrial machinery and similar industries. This too could involve policy decisions in supporting the participation of community colleges or other public training institutions to tailor training to specific company needs. This has been done in other states with good success.

5.4 Communications Services

Definition. Communications includes radio and telecommunications services including cellular, paging, wired, satellite and other telecom services. Related to this industry also is the manufacture of communications equipment.

Industry Outlook. Given the dire financial conditions of the communications industry today, this industry might not seem to have the best potential. But in thinking of the long term, telecommunication services will remain critical and will expand again once the industry is rationalized to be consistent with current demand.

Despite the current imbalances, the long-term outlook for the telecom services industry is positive, particularly for the wireless and data segments. In the near term demand is expected to recover as economic growth accelerates. Competition will continue to put pressure on prices, and firms will continue to spend on new equipment upgrades in order to remain competitive with competing technologies.

As more businesses invest in communications technology and consumers embrace new products, carriers' prospects will improve. Consumers and businesses are already spending a larger share of their incomes on telecom services, a trend that will likely continue going forward.

The recent flight to communications technology as a substitute for business travel may bolster the telecom industry if it proves sustainable. Further upside potential for telecom arises from the continued expansion of the Internet and wireless technologies.

Regional Opportunities. The regional opportunities for the communications industry lie in its major population centers—the MAG and PAG regions. The industry will naturally remain focused where it can serve the major population centers, where telecom infrastructure is concentrated, and where it can provide the densest links to the rest of the nation and the world. A greater concentration of the industry within Arizona would also provide opportunities to serve the rural regions of the state, which remain underserved by high-speed telecom systems.

Advantages. The Phoenix area provides existing resources through its current substantial base of broadband infrastructure, providing considerable comparative advantage for the industry in the MAG region. Telecommunications will continue to have export potential, particularly through the provision of services in Latin America, Asia and Africa where telecom technology is leapfrogging traditional wired services. The industry is technology based and research intensive, with potential for cooperative work with ASU's Telecommunications Research Center, thus linking the telecom service industry with telecom equipment development.

Constraints. The telecom industry has very good long-term potential. In the near term, however, it may be difficult to foster acute interest in the industry until the current

oversupply of service capacity is absorbed. Yet investing in research and development efforts today would provide useful benefits to the local economy longer term.

5.5 High-tech Instruments

Definition. High-tech instruments includes optical, medical and measuring instruments. It includes a wide range of products related to scientific research, biomedical applications and manufacturing processes.

Industry Outlook. The expectation of long-term productivity growth in manufacturing nationwide and worldwide will maintain demand for process related instruments. The increasing complexity of manufacturing will create expanded demand for industrial automation and electronic testing equipment. The outlook is particularly strong for optical inspection systems, bioscience materials and defense-related instruments. Each of these markets already has a presence within Arizona.

Foreign markets will provide considerable upside potential as well, especially if the dollar weakens further and/or global economic growth accelerates. Despite the current worldwide slowdown, developing nations still represent a long-term opportunity for U.S. instrument manufacturers. The new round of WTO trade talks could create further export growth opportunities for the precision instruments industry. Greater trade flows with China as a result of permanent normal trade relations provide further upside potential. If China and other emerging economies are successful in rapidly modernizing their industrial base, they will require sophisticated production technology.

Regional Opportunities. This is an industry with a small but expanding presence of the optical instruments industry in the Tucson area, but with potential to expand elsewhere. Some medical instruments development already takes place in Phoenix, and the industry has very good potential to expand as the TGRI becomes established in the area and genomic and proteomic research programs are established elsewhere. Thus the MAG and PAG regions have the best potential.

Advantages. The high-tech instruments industry is a highly productive, technology based and research intensive industry with good export potential. The principal advantage is the expanding presence in Arizona of research related to this industry. It builds on the existing resources at University of Arizona centers and research institutes including the Optical Data Storage Center, the Optical Sciences Center and the Institute for Biomedical Science and Biotechnology.

Constraints. The industry now is very small. Indeed it is hard to measure in terms of employment or production because much of it remains housed within university research centers. The industry depends upon active research programs through public or private institutions. These depend upon public research grants for basic research and private investment capital to develop commercial applications. Arizona does compete well for public research funds, but often comes up short for venture capital. Finally, demand for high-tech instruments related to manufacturing processes remains uncertain until improved corporate profits can support long-term capital investments.

5.6 Forest Products

Definition. Forest products includes lumber and timber as well as wood products for construction, industrial and commercial use. It also includes forest nurseries and services related to the forestry industry.

Industry outlook. Forest products is an industry of moderate growth potential for the future, yet is an industry that has been limited in the past within Arizona due to measures of forest practice management on lands under federal jurisdiction. The industry offers potential for Arizona, however, because it is a resource available in many of the rural areas in the northern and eastern counties. Moreover, as forest resources in the West become increasingly protected or closely managed, there is potential for rising prices of commodities derived from western forest resources.

Regional opportunities. Potential for this industry is largely confined to the NACOG region. This region is home to most of the forest resources in the state, and houses Northern Arizona University's Ecological Restoration Institute and College of Forestry.

Advantages. The recent forest fires in Arizona and the ensuing debates on forest management provide some upside potential for the industry. While a portion of Arizona's forest resources have been burned, the extent of the damage is generating renewed interest in research and development of forest products and practices that support the long-term sustainability of the resource. It will lead to increased research on the regrowth of the burned forests, as well as on the use of remaining forest resources that were untouched by the fires. It may provide further support for the commercial use of small-diameter trees as an integral part of forest management practices. The industry also provides a foundation for economic development in rural areas of Arizona.

Disadvantages. There are many hurdles to leap for this industry in the future. The first is technology and product development. Processes and products for small-diameter trees are still in their infant stage and need research and testing support. Land-use regulations may still limit the industry's potential. Markets need to be developed. Private-public partnerships can take a role in overcoming such hurdles, but it often takes a long period of time for public policy changes that may be needed to support this industry on a broad basis. There is considerable debate both in Washington and within Arizona on the proper ways to manage forest resources. The transition from debate to policy can be slow and arduous.

5.7 Engineering Services – Research & Testing

Definition. Engineering services includes commercial and noncommercial research of engineering systems and products and the testing laboratories that support research and product development.

Industry Outlook. This is an industry related to technology that has grown rapidly in Arizona and offers further potential in the future. It is an industry of moderate size, but is projected to be one of the most rapidly growing industries nationwide in the coming ten years. Thus, Arizona has a head start and should strive to maintain its strength in the industry. The industry has an expanding market within the state, but also has a large market within southern California and elsewhere in the Mountain West. The industry will have natural links to other research being done for biotechnology, optics, medical equipment and services and other high-tech activities throughout the Southwest.

Regional Opportunities. Three regions, MAG, PAG and NACOG have the best potential for development of this industry. MAG and PAG already have a significant high-tech industry base that will continue to expand and create demand for this industry. NACOG joins these two regions because of the research and training done at its NAU's College of Engineering and Technology. Similarly, the

colleges of engineering at ASU and UA have numerous research centers and institutes supporting testing and product development.

Advantages. Engineering research and testing has a natural link to the expanding base of technology-related industries in the Southwest. With each of the three state universities producing engineers focusing on emerging technologies, there is an endogenous workforce with the skills needed to support the industry. Moreover, the number of patents issued in Arizona each year indicate there is sufficient innovation in the state to support an expanded industry. There is also a history of partnership between Arizona's universities and private industry upon which to build.

Constraints. As with so many tech-based industries, a primary constraint can be financing. And as with the industrial machinery industry, a further constraint may be the state's property tax structure. Given the industry's need for considerable laboratory space and equipment, the high tax rate for commercial and industrial real and personal property may be a disincentive. A constraint for the industry in the NACOG region is simply its distance from the commercial and industrial centers in Phoenix and Tucson.

5.8 Transportation and Logistics

Definition. This industry includes the trucking and warehousing, railroad and the broader logistics industry often classified as miscellaneous transportation services.

Industry outlook. The long-term outlook for transportation services and logistics is bright. Domestic economic activity is expected to become increasingly dispersed as producers continually seek more advantageous and lower cost locations. This will support continued gains in the need for transportation services. The dispersion of economic activity is likely to transform transportation demand, however, shifting demand toward more service-oriented, smaller freight movement.

Inventory management will also play a large role in this trend. Inventory to sales ratios have fallen steadily throughout the past decade as firms seek to lower overhead costs and increase efficiency. These efforts to operate with a minimum of inventory will increase the demand and value of time-definite transportation services throughout the distribution network.

Overall, the versatility of the trucking industry should enable it to follow any technological developments or demand shifts, ensuring stable long-term growth. Moreover, the increased efficiency of intermodal shipping in which port, rail and trucking modes are coordinated provides further upside potential for efficiencies and productivity gains.

Regional opportunities. While the Phoenix area currently is the major transport hub, the need to further improve transport links to California, Nevada, Mexico and points to the east provide opportunities for the CAAG, PAG, SEAGO and WACOG regions. Recent improvements in highway and rail corridors leading out of the ports of Los Angeles and Long Beach reduce the transport time or economic distance to the WACOG region. Although longer term, the WACOG region would further benefit from improved highways and the proposed Hoover Dam bypass that are part of the proposed CANAMEX plan. The PAG and CAAG regions along I-19 and I-10 will benefit longer term from trade with Mexico. As manufacturing with Mexico disbursts farther south, southern Arizona not only expands as a gateway, but it will increasingly become a one-day drive from points of origin in central Mexico, making it a logical stopping point for transshipments and logistics management.

Advantages. Logistics is becoming an increasingly technology-intensive industry closely linking manufacturing, distribution and retail activities. Arizona is positioned to

link such activities between its own market, Mexico, southern California, Texas and the Gulf Coast. Currently, transportation largely connects with points east and west, but Mexico offers potential to add a third compass point, improving Arizona's potential as a transport hub. The industry offers potential for economic development outside of Arizona's central core, increase the economic links to the rural regions, and create employment opportunities for the rural regions' workforce that will become increasingly productive and technology intensive. Telecommunications and Internet applications are increasingly used to manage logistics services. Research links with the University of Arizona's Center for Advanced Traffic and Logistics Algorithms and Systems could further advance this use of technology.

Arizona's location should provide increased competitive advantage over the long term. First, an increasing amount of trans-Pacific trade will go through the ports of Los Angeles and Long Beach due to their expanded facilities and to the improved access afforded by the recently completed Alameda Corridor that improves access and egress through congested and urbanized parts of southern California. This shortens the economic distance between Arizona locations and the ports.

Second, as Mexican maquiladora plants are transformed into producers of higher-value-added products, inventory management and transportation across the border will be increasingly critical to manage costs in a competitive global marketplace. While much of the border traffic related to Mexico's industrial center of Monterrey would continue to pass through the Texas border, products produced in Baja California, Hermosillo and even farther south in Guadalajara would pass through San Luis or Nogales on their way to U.S. markets.

Disadvantages. A primary disadvantage is that the state lacks a direct link along a fourth compass point to the north. Most major transport hubs nationwide do have links in four directions but northbound transportation has always been constrained by the Grand Canyon, a formidable natural barrier. Additionally, there are few large points of origin/destination to the north.

Longer term, however, Arizona's transportation industry will benefit from the development of the CANAMEX highway system, a federally designated priority corridor from Nogales to Sweet Grass, Montana on the Canadian border. It will pass through Arizona beginning with I-19 from Nogales to Tucson, I-10 to Phoenix, US 60 into Nevada across Hoover Dam to Las Vegas, where it becomes I-15 to Salt Lake City and points north. Projects in Canada and Mexico envisage links to Edmonton to the north and Mexico City to the South. The Arizona Department of Transportation has already invested significant funds in US 60 to straighten curves and add passing lanes. Furthermore, ADOT is collaborating with Nevada's highway department on a bypass across the Colorado River just south of Hoover Dam. This four-lane bypass is the most important project in the West for the Department of the Interior. Its Bureau of Reclamation and National Park Service are joined by the Federal Highway Administration, the Western Area Power Authority and the two states on the project management team. The planned opening of the bypass in 2007 will provide Arizona safe and reliable all-weather access to Las Vegas and points north.

Further near-term disadvantages arise from current capacity constraints elsewhere in the state, the need to rebuild old highway surfaces, and the need to widen congested highways, particularly I-10 between Phoenix and Tucson. Congestion at border crossings in Nogales, Douglas and San Luis also will have to be relieved over the long term. In addition, further road improvements and maintenance would be required if Congress eases regulations regarding maximum truck weight limitations. Larger and heavier trucks would add further stress to roadway surfaces that are already due for reconstruction (I-40) or widening (I-10). Additional investment in road quality would be necessary.

5.9 Agriculture/Food Processing/Specialty Crops/Agricultural Technology

Definition. This is a broadly defined category that includes the direct production of agricultural products, the processing of farm commodities into food products or other products, and the development and use of technology related to these activities.

Industry outlook. While agriculture and food processing are not among the growth leaders nationwide, this industry is included in Arizona's list of potential growth industries because it does represent a considerable local resource with the potential to continue to change and become more technology focused and directed toward high-value specialty markets.

Regional opportunities. Agriculture still generates considerable opportunity in the CAAG, SEAGO and WACOG regions.

Advantages. While Arizona may face considerable competition for basic commodity crops, its warm climate and availability of irrigation water provide ample opportunity for high-value specialty crops destined for major U.S. and global markets. Irrigation water, while under increasing demand pressure from urbanized uses, remains plentiful at least in CAAG and WACOG. The supply of irrigation water is more constrained in SEAGO, where groundwater is the primary source. Moreover, SEAGO's San Pedro riparian area is sensitive to high water use projects.

Technology available to Arizona-based firms for the management of land and water resources should continue to provide local producers considerable advantage over producers elsewhere in North America or elsewhere in similar climates. Moreover, given sufficient investment capital, a companion industry in agricultural technology related to efficient water use and to the improved use of GPS systems and the like for management of production, water use, pest management and harvesting could add great value to the industry. Additionally, as global agriculture increasingly spreads to marginally productive lands, any technology that is devised for use in Arizona's arid climate could have considerable export potential.

Processing of food products offers further advantage for adding value to farm products and boosting local incomes. Thus, the use of technology is not limited to production, but also to post-harvest processing of farm commodities to meet consumer or industrial demand.

Finally, the industry could gain advantage from research done within Arizona at the University of Arizona's Arid Lands Information Center, Remote Sensing Center, and Water Resource Research Center.

Constraints. Expanding urbanization will put increased pressure on farmland and irrigation resources particularly in the CAAG region south of Phoenix. Similarly, water resources in SEAGO are more limited and could constrain the industry's long-term potential in this region.

5.10 Defense/Aerospace/Avionics

Definition. This is an industry that has long anchored Arizona's economy and includes the production of aircraft, aircraft parts, weaponry, and navigation, guidance and aeronautical systems.

Industry Outlook. Defense and aerospace industries will be logical driving industries for Arizona in the coming years. The industry has a long history in Arizona, but suffered much volatility when the Cold War ended more than a decade ago. The industry, however, is poised to expand in the coming years. Defense Department procurements are already beginning to rise, and the Pentagon projects a peak 15% growth rate of procurement contracts by fiscal year 2005, followed by high single-digit growth through the end of the decade. This means demand growth for defense-related industries will accelerate over the next two years, and will continue to expand through the end of the decade. The testing and deployment of a missile-defense system and the manufacture of new fleets of advanced fighter jets provide much upside potential for the industry.

Regional Opportunities. Defense-related and aerospace industries are concentrated in the Phoenix and Tucson areas, but they also have a presence by the military bases near Yuma and Sierra Vista. Thus, MAG, PAG, WACOG and SEAGO have opportunities to take advantage of rising defense expenditures going forward.

Advantages. Arizona's long history of links to army and air force aviation go back to the days of World War II when pilots were trained in Arizona. Today aircraft and aerospace firms remain among the largest employers in the Tucson and Phoenix metropolitan areas and each is home to an air force base. Thus, the industry is poised to gain from the need to modernize defensive and offensive air force systems. Research and development work linked to Ft. Huachuca near Sierra Vista and the Army Proving Grounds in Yuma are less certain to expand, although there is potential.

The war on terrorism provides considerable potential for the defense-related aerospace industry. Improved cash flow, rising productivity and greater product diversification across firms within the industry offer potential for a pace of growth not seen in more than a decade. Shifting industrial policy at the Pentagon may also spread the benefits of R&D and procurement to a broader range of industries. For example, the Pentagon has commissioned a study to examine its nontraditional supplier base and to seek ways that telecommunications equipment and specialty instrument and optical equipment firms can contribute to defense-related work. There is also much potential for smaller firms to participate in defense procurement as the Pentagon broadens from its traditional top-tier supplier base. Thus, Arizona's defense and aerospace industry will need access to research & development capital, as well as skilled workers and researchers in the years to come.

Constraints. There are risks for the industry, however. It will have to adapt quickly to new priorities that focus on technology, systems and long-range delivery of weapons and personnel. Some major aircraft or weapons systems based on Cold War assumptions may have to be scrapped in order to be able to afford new advanced systems. Thus, there is the need for more concentrated R&D investment and engineering and testing work to bring new products to the production stage at a rapid pace.

There is also some long-term downside risk to the industry. Just as the industry consolidated sharply following the end of the Cold War and the subsequent falloff in defense procurement contracts, government policy could shift again during the next decade due to unforeseen circumstances. But given the historical presence of the industry in Arizona, it should capitalize on the current rising trend in defense spending.

Further expansion of commercial aircraft parts and space vehicles offers some potential for reducing the risk of volatility for the industry. Indeed, the industry today is not exclusively defense related. For example, Honeywell produces products for the civilian aviation industry.

6. Economic Outlook – Baseline and Alternative Forecasts

Productivity and Economic Growth. Regional economies have historically relied on both the growth of their labor force and the productivity of that workforce to drive output and income gains. Regional economic gains are increasingly determined by productivity growth. This section explores how measures of comparative advantage impact productivity and in turn influence regional economic growth. Results of an empirical analysis of regional comparative advantage indicators and economic growth are presented. The results of this analysis combined with Economy.com's state econometric modeling system are then used to create three forecast scenarios for Arizona's economy. The results of this analysis underscore comparative advantage indicators' impact on state productivity and in turn economic performance. The objective of this analysis is to frame the baseline outlook with upper and lower bounds as defined by changing assumptions for Arizona's measures of comparative advantage.

National economic trends drive a substantial portion of a region's economic growth. After accounting for national economic growth, differences in regional economic performance can be explained by the quality and quantity of a region's physical capital (e.g. structures and machinery) and human capital (education and work experience). There are several ways policy can impact the quality of human capital and quantity or quality of physical capital and thus impact economic growth. For instance, a reduction in tax rates may stimulate business investment and boost the physical capital stock. Alternatively, increased spending on education could improve the quality of a region's workforce and elevate human capital.

Methodology. To analyze the impact of comparative advantage indicators on regional economic growth a panel of all fifty states and the District of Columbia was used. In order to measure the effects of comparative advantage measures on a region's productivity it is necessary to isolate their effects from the effects of national economic trends and population growth. To do this, we estimated a panel regression across states using the difference between state and national ten-year real income growth per capita (or excess growth above or below the U.S.) as the dependent variable. Various measures of comparative advantage were used as independent variables. We attempted to restrict the selection of comparative advantage measures to those that could presumably be influenced by policy.

After determining which comparative advantage measures impacted real state income growth per capita with statistical significance, the estimated coefficients were used to produce forecast scenarios. The panel regression contains five independent variables: Economy.com's tax burden index, the percentage of population over age 25 with a bachelor's degree or higher, the crime rate, mean SAT score and total research and development funds per capita. All of these variables have a statistically significant impact on economic growth presumably by impacting productivity. An average of each measure over the ten-year period was used.

Arizona falls close to the middle of the pack for these comparative advantage measures with the rest of the states (see Table 16). One notable exception is the state's rather high crime rate. In order to determine what effect raising or lowering the state's comparative advantage indicators would have on the economy, a high and low scenario were computed. The baseline scenario assumes that Arizona's relative

Table 16: Comparative Advantage Indicators

	Tax Burden Index, U.S. = 100	Share of Pop. Over 25 with Bachelor's or Higher, %	Crime Rate, crimes per 1,000 persons	Mean SAT Score	R&D funds, \$ ths per capita
	Sources: Economy.com	Source: BOC	Source: FBI	Source: The College Board	Source: Nat'l Science Foundation
Alaska	111.9	25.1	51.4	1029	0.078
Alabama	77.2	17.2	46.9	1114	0.142
Arkansas	89.5	15.7	45.5	1110	0.071
Arizona	102.9	22.0	68.6	1045	0.437
California	102.6	25.7	54.6	1007	1.058
Colorado	93.0	31.7	50.2	1073	0.678
Connecticut	99.9	30.3	43.2	1013	0.955
District of Columbia	128.3	36.0	99.8	961	0.580
Delaware	102.5	23.1	47.4	999	1.841
Florida	92.3	21.0	73.3	994	0.215
Georgia	91.0	22.0	57.4	964	0.173
Hawaii	121.4	24.8	59.8	993	0.055
Iowa	103.4	19.9	34.8	1188	0.216
Idaho	104.2	19.9	38.3	1079	0.876
Illinois	93.9	24.3	50.2	1140	0.569
Indiana	90.0	16.0	40.0	990	0.421
Kansas	96.9	25.6	45.3	1150	0.363
Kentucky	93.8	17.7	31.7	1095	0.108
Louisiana	88.4	18.9	60.2	1114	0.029
Massachusetts	98.9	31.0	37.9	1014	1.386
Maryland	93.1	29.1	57.5	1013	0.297
Maine	114.6	20.7	32.2	1002	0.126
Michigan	103.4	20.1	50.9	1119	1.492
Minnesota	112.9	26.4	41.3	1168	0.624
Missouri	84.1	21.9	48.4	1135	0.285
Mississippi	92.2	17.6	38.6	1114	0.029
Montana	104.2	22.6	38.0	1088	0.058
North Carolina	91.0	20.7	53.5	978	0.384
North Dakota	109.9	21.2	25.9	1186	0.064
Nebraska	96.8	21.7	42.1	1129	0.073
New Hampshire	82.6	26.8	27.2	1035	0.601
New Jersey	106.1	28.4	43.7	1003	1.194
New Mexico	98.0	22.7	56.9	1098	0.744
Nevada	100.3	18.6	54.9	1021	0.160
New York	132.3	25.5	46.1	995	0.536
Ohio	103.4	20.9	42.3	1073	0.476
Oklahoma	91.2	20.7	52.8	1122	0.103
Oregon	104.5	24.1	57.0	1046	0.361
Pennsylvania	95.3	20.9	32.1	990	0.554
Rhode Island	101.8	24.7	41.1	994	0.727
South Carolina	91.0	18.4	58.1	955	0.172
South Dakota	84.9	20.6	27.9	1153	0.026
Tennessee	80.1	17.1	48.8	1117	0.232
Texas	88.4	22.3	60.3	993	0.375
United States	100.0	23.1	50.8	1013	0.542
Utah	103.9	24.7	53.4	1147	0.399
Virginia	84.0	27.0	39.1	1003	0.287
Vermont	106.9	26.6	30.5	1010	0.446
Washington	114.6	26.5	58.3	1041	1.110
Wisconsin	114.6	21.4	38.3	1163	0.325
West Virginia	107.8	13.7	25.6	1033	0.112
Wyoming	90.3	20.9	40.5	1087	0.027

Note: Data are ten-year averages, 1991 to 2000, except:

SAT scores are eight-year averages, 1993 to 2000

R&D funds are averages of 1992, 1995, and 1997 to 2000

While Arizona's average tax burden index over the ten-year period is 3% above average it's latest index for 2000 is equal to the U.S. average.

position amongst other states in terms of comparative advantage remains the same over the forecast period.

For the high forecast, we computed the predicted 10-year real per capita income growth using the best-ranked state observation for each comparative advantage indicator with the exception of the tax burden index. For the high scenario, the tax burden index was changed to the rate of the lowest-ranked state, i.e. the highest tax burden, based on the assumption that improving comparative advantage measures such as the crime rate and educational attainment would require increasing government expenditures.

For the low forecast scenario, the weakest state measure for each indicator was used and the tax burden index was changed to the best-ranked state, i.e. the lowest tax burden. For these two scenarios, the District of Columbia was restricted from the sample as it is somewhat of an anomaly.

After computing the predicted growth using the panel regression results, we then incorporated these results into our state econometric model of Arizona's economy. Economy.com's state econometric modeling system uses personal income as a key economic driver, thus the impact of higher or lower income growth on other key economic variables can be analyzed.

Results. According to the panel regression results (see Table 17), the measures of comparative advantage have varying positive and negative impacts on excess 10-year real income growth per capita. Overall, the five comparative advantage estimates explain 40% of the difference in real income growth per capita across states. Changes in taxes explain the highest percentage of movements in income growth across states according to the regression results. Holding all else constant, a one percentage point rise in Economy.com's tax burden index results in a 0.18 percentage point decline in 10-year real income growth per capita on average. The decline in income growth associated with rising taxes is expected as taxes directly increase the cost of physical capital.

Again, all else constant, if the share of population with a college degree or higher rises by one percentage point, then 10-year real income growth per capita would rise by 0.40 percentage points on average. The positive relationship between education and higher income growth is explained by an increase in human capital and the resulting increase in productivity. Like education, higher SAT scores result in higher real income growth. A ten-point rise in the mean SAT score would push up 10-year real per capita income growth on average by 0.2 percentage point. As expected, the

Table 17: The Impact of Comparative Advantage Measures on Regional Economic Growth

Variable	Coefficient	T-statistic	Adj. RSQ
Constant	-6.85	-0.52	0.34
Tax Burden Index	-0.18	-3.24	
Educational Attainment (% with college or higher)	0.41	2.40	
Crime Rate	-0.14	-2.82	
SAT Score	0.02	1.90	
R&D Funds	2.68	1.60	

Dependent Variable = 10-year Real State Income Growth per Capita Minus U.S. Growth

Source: Economy.com

crime rate has a negative impact on income growth. As the number of crimes committed per thousand persons rises by one, 10-year real income growth per capita falls by 0.14 percentage points on average. Finally, research and development funding, which is tracked by the National Science Foundation, has a positive impact on income growth. A one-thousand-dollar increase in R&D funding per person will increase 10-year real income growth per capita by 2.67 percentage points on average.

Forecasts. After computing high and low 10-year real income growth per capita using the results of the panel regression, Economy.com's state econometric modeling system was used to analyze the impact of higher or lower real income growth per capita on other economic indicators. The forecast scenarios for Arizona, along with Economy.com's U.S. forecast are reported in Table 18. The table includes ten-year annualized growth in real gross state product, total employment, real income per capita and the average unemployment rate for the period 2002 to 2012.

Economy.com's baseline forecast for Arizona assumes that the state's relative ranking in terms of its comparative advantage measures holds constant over the ten-year forecast period. In terms of average annual real GDP and employment growth, Arizona is expected to significantly outpace the U.S. as a whole over the forecast period. Annualized ten-year real GDP growth is expected to be 4.9% over the period, while employment growth is expected to be 3.4%. A substantial portion of GDP and employment growth stems from population growth. After accounting for population growth, real income growth per capita is expected to be slightly higher than the U.S. average over the forecast horizon at a 1.6% annualized pace. The unemployment rate in the state is expected to remain close to the U.S. average over the forecast period at an average of 5.4%.

Under the high growth scenario, Arizona's comparative advantage measures are assumed to improve to equal the best of all states in each case, with the exception of the tax burden index, which falls to the worst of all states. The impact of elevated comparative advantage measures and an increased tax burden significantly affects Arizona's economic prospects. Under the high growth scenario, all of the economic indicators in Table 18 improve. Annualized real GDP growth climbs to 5.3%, while employment growth hits an annualized rate of 3.7%. Real income growth per capita also rises to 2.6%. The unemployment rate in the state falls to an average of 5.3%. The model illustrates that per capita income is particularly responsive to changes in the scenarios.

In the high growth scenario, Arizona's tax burden index climbs to Massachusetts' rate of 132% of the U.S. average in order to accommodate increased government spending associated with an improvement in comparative advantage indicators. The state's percentage of people over age 25 with a college degree or higher climbs to 32% (Colorado) from its current average of 22%. The crime rate in Arizona falls from 69 crimes per thousand to West Virginia's low rate of 26. Arizona's mean SAT score improves by 142 points to Iowa's average score of 1188. Finally, the total research and development funds coming into the state per person more than quadruples to Delaware's level.

Table 18: Arizona Economic Forecast Scenarios 2002-2012, annualized growth rate, %

	Real Gross Product	Total Employment	Real Income Per Capita	Unemployment Rate (average)
Baseline	4.9	3.4	1.6	5.4
High	5.3	3.7	2.6	5.3
Low	4.8	3.3	1.5	5.4
U.S.	3.1	1.4	1.6	5.3

Source: Economy.com

Alternatively, under the low growth scenario in which Arizona is assumed to fall to the bottom of the pack in each comparative advantage measure, with the exception of the tax burden, the state's economic performance suffers slightly. Under the low growth scenario, annualized real GDP growth falls to 4.8%, while employment growth edges down to 3.3%. Real income growth per capita falls to 1.5%. The unemployment rate in the state does not change significantly.

In the low growth scenario, Arizona's tax burden index falls to Alabama's rate of 77% of the U.S. average as it is assumed that government spending and taxation declines. The state's percentage of people over age 25 with a college degree or higher falls to 14% on par with West Virginia from its current average of 22%. The crime rate in Arizona ascends somewhat to Florida's average of 73 crimes per thousand from 69. Arizona's mean SAT score declines to South Carolina's average of 955. Finally, the total research and development funds coming into the state fall to close to nothing per person as has been the case in South Dakota.

This study demonstrates how improved comparative advantage measures can significantly elevate regional economic growth prospects by improving worker productivity. The smaller downside economic risk associated with a decline in comparative advantage measures likely stems from the accompanying drop in the tax burden index, which was assumed to take place given decreased government spending. It is likely that the drop in the tax burden index would partly offset the declines in productivity due to weaker comparative advantage measures by attracting more low cost seeking relocating businesses. These scenarios indicate that the economy can be very responsive to changes in measures of comparative advantage. They are not meant to imply that one must have the highest tax rate to raise these measures, nor vice versa. They are simply intended to provide parameters to illustrate that measures of comparative advantage do matter over the long term for the performance of the economy.

7. Foundational Issues

Over the course of this study three industries were identified as underrepresented in the Arizona economy aside from the ten described in Section 5. These three include: 1) certain components of tourism such as museums; 2) financial services; and 3) education services. They suggest further economic opportunities for the state and its regions. These industries include certain components of tourism such as museums, financial services, and education. Yet upon further examination and discussion with stakeholder groups, these industries seemed more than just economic opportunities. They address some of the basic foundations of the economic wellbeing of the state. Additionally, a fourth industry, health care, was retained among the list of economic opportunities because of its potential of becoming a driving basic industry in the state. But it, too, overlaps some foundational issues of the economy. This section will address each of these issues and how they may have an impact upon the economy in the coming years.

7.1 Tourism

As discussed earlier, components of tourism are classified as dynamic and stable industries based on their performance over the past ten years. Indeed, much of the economy's growth since World War II has been based on the pattern of households first visiting Arizona, either on vacation or less voluntarily through military service, and later deciding to make a move to the state. Furthermore, given the varied topography, history and cultures throughout Arizona's regions, nearly every region

benefits in some form by tourism. Finally, the emergence of miscellaneous amusement industries as underrepresented in the economy suggested there was further potential for activities such as museums and the cultural arts. The potential for further diversification, the ubiquitous nature of the industry in Arizona and its historical context suggested further opportunity.

Two factors suggest that tourism is, in some ways, more of a foundational issue supporting the broader socio-economic wellbeing of the state. First is that it has been, and likely will continue to be, a defining factor of the economy without much need for public policy action to maintain it as such. But second, factors supporting tourism also underlie the basic quality of life that attracts and retains a high-quality workforce in the state.

The fact that components of tourism such as museums and the cultural arts are smaller than our econometric models would suggest, indicates that this is a way that the quality of life for Arizonans can be enhanced. Thus, as tourism continues to develop as a driving force to attract visitors and to build income and wealth in the state, it may be appropriate to focus tourism toward ways in which it can benefit the quality of life of the local workforce. Tourism in the future, therefore, can evolve from simply another economic opportunity into an opportunity to improve the quality of life through the performing and cultural arts and thus improve Arizona's ability to attract and retain the skilled and educated workforce that its emerging economy will require.

7.2 Financial Services

Financial service institutions were similarly identified as being underrepresented in the economy. More fundamentally, there seems to be a mismatch between the amount of innovation that takes place in the Arizona economy and the financial resources available to turn the innovation into commercial products. Venture capital investments, which are well documented, are sorely lacking in the state. Similarly, but more anecdotally for data is less available, support for international transactions is limited in the state. Also, the number of financial institutions that are headquartered in the state has shrunk, as it has in many areas due to a general consolidation of the industry following its deregulation during the 1980s. Finally, it may be increasingly difficult to attract direct foreign investment to Arizona given assumptions of a weaker dollar in the coming years and improved productivity abroad.

Thus, it seems increasingly necessary to bring the potential of Arizona's economy directly to investors as a foundational issue for the economy. This would not be just to expand and diversify the economy with another industry but to provide support for the industries suggested in this report, and for the other industries that remain dynamic and growing components of the economy. Increasingly flexible and responsive financial service products will be an important component of any economy to compete nationally and globally in the coming years.

7.3 Education and Workforce Quality

Perhaps the most resounding outcome of the research related to this report was the finding that numerous measures of education performance and outcomes were not only below average but also near the bottom of all states. If it is not near the bottom, it ranks below the states against which it competes for productive and technology-based industries. Moreover, on a regional basis as well, there is a sharp difference between measures of workforce quality in the central core regions of the state versus the more rural regions.

Arizona is able to make up for some of these shortcomings by its climate and quality of life that attract a skilled workforce from outside the state. No doubt, migration will

continue, but it will account for a gradually diminishing share of the total workforce and employers will have to turn increasingly to homegrown talent. Certainly one can obtain a very good education all the way through college through the public education systems in Arizona, but many are slipping through the cracks.

Thus the need for continuing to improve not only the K-12 system in Arizona, but its university system as well. In addition, it should be remembered that the community college system can be used very effectively to link training specific to employer needs. Each of these components of the overall education system is critical to the future of Arizona's economy.

7.4 Healthcare

A final foundational issue for the economy is healthcare. Healthcare employment as a share of total employment is consistently below average in all regions of the state, and healthcare services are concentrated in Phoenix and Tucson. As described under the state's comparative advantages, aggregate healthcare statistics for the state are not bad. But they do mask two important factors. One is the lack of acute care facilities in some of the rural areas. During interviews with directors of regional economic agencies, this was cited as a factor in not being able to retain talented members of their workforce. Second, it also masks concentrations of disease incidences in rural areas. For example, the contribution to TGRI of \$5 million by tribes, led by the Salt River Pimas, is indicative of the need for research regarding diseases such as diabetes that have a high incidence among the tribal populations in Arizona.

As a foundational issue for Arizona, it has an impact on the social and economic wellbeing of the state. The social wellbeing arises from the access to quality healthcare. The economic wellbeing relates not only to the health of the workforce, but the ability to attract a quality workforce to any region of the state to follow and support regional economic activity.

8. Regional Briefings

8.1 Maricopa Association of Governments (Maricopa County)

8.1.1. Current economic trends

The MAG economy is still struggling to rebound from recession that began in early 2001. Payrolls have stabilized since this spring, but manufacturing continues to contract. Services and construction, two other important MAG industries, are holding steady. MAG lost 30,000 jobs since March of 2001, and the unemployment rate, while improving since spring 2002, remains above 5%.

With about three-quarters of all economic activity in the state based in MAG, the area has borne the brunt of the state's recession.²⁴ The contraction in demand for semiconductors and other electronic products hit MAG's high-tech manufacturers hard. Furthermore, the drop in domestic and international air-travel and tourism following the events of 9/11 hurt MAG's tourism industry and put considerable pressure on the airline industry. The resulting layoffs spanned the area's trade, service and transportation industries, and the county's tourism industry has not recovered fully from this downturn yet. Data from Smith Travel Research indicates that hotel occupancy rates this year

²⁴ Economy.com estimates that gross regional product for MAG accounts for 76% of Arizona's gross state product in 2002.

through April at 69% nearly matched the same period for 2001, but lower room rates kept revenue per available room down by 11% over the year.

There are some indications, however, that the contraction has hit bottom. The jobless rate has fallen from its February 2002 peak, and service-producing employment is stable. Moreover, semiconductor manufacturing is seeing the first signs of a recovery through improved domestic and international demand, and other tech-related industries may see firming demand by the end of this year. Further, rising defense spending contracts will also prove beneficial to MAG's manufacturers.

Despite near-term woes, MAG's economy remains the most diverse of all of Arizona's regions and outpaces the rest of the state by most measures of economic wellbeing and comparative advantage. It has the lowest poverty rate at 11.7% (1999) and the highest per capita income at \$22,300 (1999 census estimate).²⁵ MAG's population growth of 3.8% over the 1990s is not the fastest due to its large size, but it is well above the U.S. rate of 1.1%. MAG's unemployment has consistently remained below the U.S. average at both the peaks and troughs of business cycles since the late 1970s.

8.1.2. Industrial Structure

Leading and lagging basic industries. Given that the MAG area is such a large share of the statewide economy, its industrial structure looks very much like the statewide structure described in earlier sections of this report. The industries that fit the category of dynamic can be categorized generally as construction, consumer and business finance, amusement and recreation services, and management and public relations (see Table 19). All of these industries are indicative of the rapid growth of the region in that they are driven by both endogenous as well as exogenous factors. Construction is meeting the need for housing and commercial space in the region and is usually not considered basic. But it does depend, in part, on the wealth that is brought from outside of the local economy by in-migrants. Similarly, banking and finance, amusement services and management and public relations serve broad local markets. They each also can be termed basic, however, as each either exports some of its services to markets or branch operations outside of the region, or sells services locally to visitors. For example, American Express's regional operation, is one of the area's ten largest employers. Schwab also maintains several back-office operations in the region. It is important to note, however, that each of these industries is dependent to a certain extent upon the general growth of the economy, and would be at risk were the overall rate of growth to slow for an extended period of time.

MAG's growth industries include trucking and general transport services, arrangement of transportation services (such as travel and cargo brokers), and business services, particularly personnel supply services. Trucking and transport services illustrate the growing economic linkages between the Phoenix area and the broader Southwest region. Similarly, personnel supply services illustrate the area's increasing use of a flexible workforce, which is employed in a variety of industries. Temporary workers fill jobs at back-office financial operations, but many of them also work in manufacturing as well.

²⁵ The BEA's broader estimate of per capita income for MAG in 2000 is \$28,329, still highest among Arizona's regions.

Table 19: Characteristics of MAG's Basic Industries

Dynamic Industries

- 15 Building contractors
- 17 Special trade contractors
- 602 Commercial banks
- 606 Credit unions
- 615 Business credit institutions
- 79 Amusement and recreation services
- 874 Management and public relations

Growth Industries

- 421 Trucking services and general transport services
- 47 Arrangement of transportation services
- 73 Business services, including personnel supply services

Stable Industries

- 367 Electronics manufacturing
- 382 Measuring and controlling instruments
- 45 Air transportation
- 58 Restaurants
- 63 Insurance carriers

Deconcentrating Industries

- 07 Agricultural services
- 372 Aircraft and parts manufacturing
- 48 Communications
- 65 Real estate
- 70 Hotels and lodging

Note: MAG consists of Maricopa County

Over the course of the past ten years, manufacturing industries do not appear as either dynamic or growth industries, however. MAG has relied heavily on services and construction to keep its economy expanding.

To be sure, manufacturing provides a stable base for the economy over the long term. Among the stable industries are two large manufacturing industries—electronics, and measuring and controlling instruments, which are linked partially to the aerospace industry. These industries reflect the presence of such major employers as Honeywell, Motorola and Intel. A budding electronic component distribution network, anchored by Avnet, also complements MAG's concentration of high-tech manufacturers. While over a ten-year period these are considered stable, the downturn in demand for their products beginning in 2000 contributed to the area's recent recession. Other stable industries include air transport and restaurants; each related closely to travel and tourism. The importance of these industries to the stability of MAG's economy is also indicated by the downturn in airline and related employment following 9/11 that contributed to the recent recession. Aside from manufacturing, insurance carriers are categorized as a stable basic industry over the past decade, indicative not only of the general growth of the region, but of an increasing number of regional and back-office operations in the area.

Deconcentrating industries include a broad range of industries. Hotels and lodging within this group represent a correction to overbuilding that occurred in the mid-1990s. This is reflective of the industry's building boom earlier in the decade. Aircraft and parts reflect the slowdown and restructuring taking place among defense-related and civil aviation manufacturers over the past decade. Similarly, the deconcentration of communications illustrates this industry's restructuring in light of deregulation and increasing competition nationwide. Real estate as a deconcentrating industry is more of

an indication of the broadening of MAG's economy over the decade rather than a loss. This is one "growth related" industry that is actually seeing its relative presence in the economy begin to ease. Agricultural services, about 75% of which is landscape and horticultural services, also is simply related to growth of the broader economy. Its deconcentration is another reflection of the increasing diversity of the economy. Yet with 25% of employment in the industry related to farm services, it also is illustrative of the increasingly urbanized structure of MAG's economy.

MAG's industrial structure is rather diverse. Economy.com's index of diversity for MAG of 0.67 is well above any other region in Arizona (see Appendix). But more importantly, it is higher than most metropolitan areas of similar or larger size in the U.S. The index, which is defined in the Appendix, estimates how closely the distribution of employment across industries compares to that of the U.S. The U.S. index equals 1.0. The index for Maricopa plus Pinal counties, i.e., the Phoenix metropolitan area, is slightly higher than MAG at 0.68. While the Phoenix metro area ranks 12th nationwide in terms of total payroll employment, it ranks ninth in terms its diversity index. Moreover, among the 15 largest metro areas, only Chicago, Boston, Atlanta and St. Louis are more diverse. Extending the comparison to the 30 largest metro areas, Oakland and Portland are also more diverse. But Phoenix's mix of tech-based industries, services, finance, transportation and others, generates a fairly well diversified economy.

8.1.3 Measures of Comparative Advantage

8.1.3.1 Population

MAG is one of the faster growing regions in Arizona, increasing by 45% over the past decade (see Chart 53). During this same period, the rest of the state's population rose by approximately 33%. The region's strong population growth has been fueled by migration into the region. Typical of elsewhere in the state, net migration accounts for more than half of MAG's population increase each year. MAG's population growth has, in turn, fueled much of its retail service and construction industries, as indicated by its pattern of basic industries. MAG's population growth has slowed moderately in recent years and is not expected to return to the soaring rates that approached 5% annually during the mid 1990s. During the coming ten years, the population increase each year should continue to amount to between 90,000 and 95,000. A steady level of increase, however, means that the impact of migration on the total economy eases moderately, and the rate of population growth also begins to slow.

MAG's population is young compared to the rest of the state. Its share of residents over 55 is the lowest among all of Arizona's COGs. While MAG has attracted many retiree households in past years, its growth is equally dependent upon attracting businesses and working-age households.

8.1.3.2 Income

MAG's per capita income trends, as measured by the decennial census and deflated by the consumer price index, nearly match the national average. Real income growth between 1989 and 1999 averaged 1.0% annually, versus approximately 1.1% for the rest of the state and the U.S. (see Chart 54).

Per capita income, however, remains approximately 94% of the national average. This gap has remained fairly constant over the past 40 years according to data from the decennial census.

Chart 53: Population Growth, Maricopa County

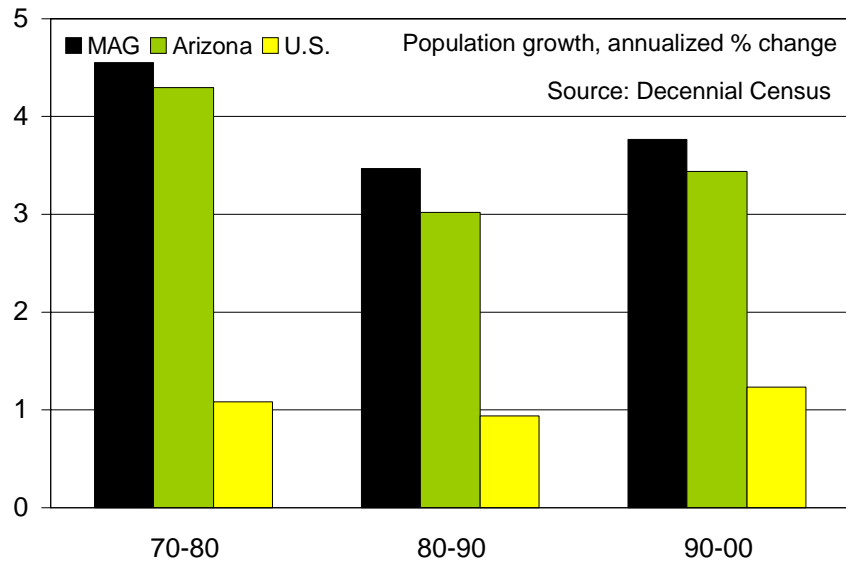
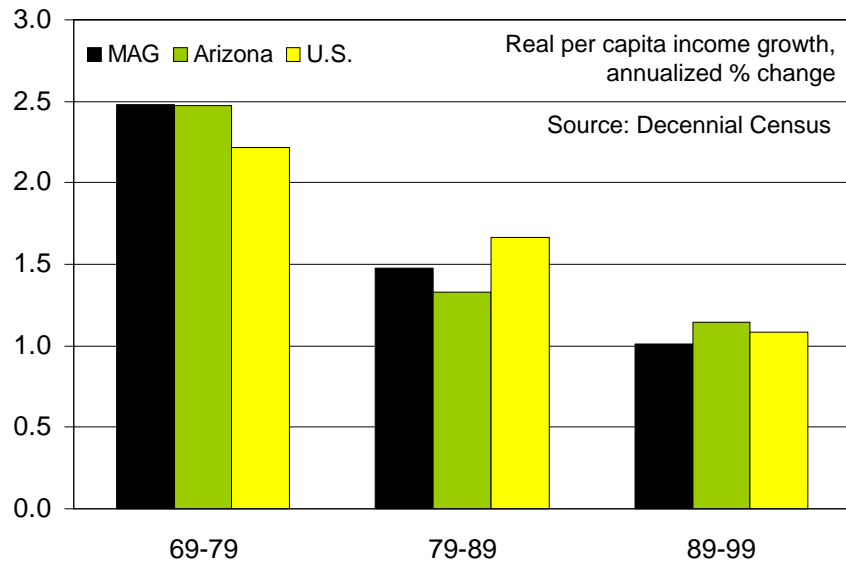


Chart 54: Income Growth, Maricopa County



Annual aggregate income growth has nearly consistently outpaced the national average over the past 30 years, reflecting the area's overall growth. The only exceptions are during recession years, according to annual estimates from the Bureau of Economic Analysis, when MAG aggregate income tends to fall more quickly, indicative of the very procyclical nature of the Phoenix area economy.

The MAG region demonstrates a relatively high degree of credit stability. MAG has an average rate of personal bankruptcy filings below the national average. Moreover, growth in bankruptcy filings has been extremely low in MAG, despite the robust growth in population in the region. Thus, despite per capita income slightly below the U.S. average, household balance sheets appear to be in good shape.

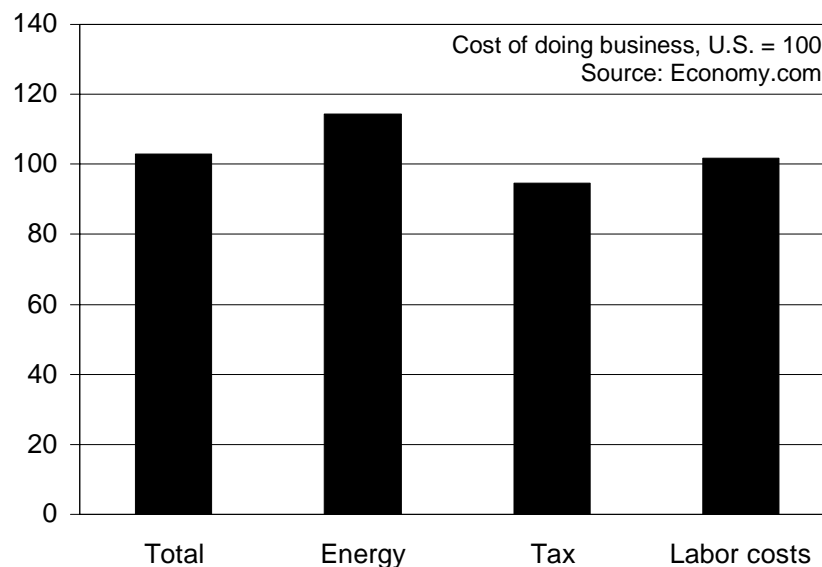
8.1.3.3 Cost of Doing Business

Similar to all of Arizona's regions, business costs for the MAG region are just slightly higher than the nationwide average according to Economy.com's cost of doing business index (see Chart 55).²⁶ None is significantly higher. Unit labor costs are 2% above the national average. Energy costs in MAG also are moderately higher than the national average, although they are very near other mountain states and well below energy costs in California.

A below-average tax burden and low office costs nearly offset the slightly higher labor and energy costs. The overall tax burden is 6% below the national average. It bears repeating, however, that the structure of the tax burden, with higher taxes on commercial and industrial real and personal property, does put MAG at a disadvantage for manufacturers.

Office costs contribute to only 10% of the total cost of doing business index, but low office space costs do help keep MAG's costs down. For example, according to the National Real Estate Index, a recognized source of comparative real estate costs, office rental rates in the Phoenix metro area were only 70% of the national average in 2001. The

Chart 55: Cost of Doing Business, Maricopa County



²⁶ The cost of doing business index for metropolitan areas is based on four factors. Labor costs as measured by unit labor costs or earnings per dollar of output. Unit labor costs are determined for each 3-digit SIC industry and compared to the same industry nationally. Energy costs as measured by average cost per kilowatt-hour for commercial and industrial users. Tax burden as measured by total taxes and fees as a percent of total personal income. Office costs as measured by the average price paid per square foot for class A office space. In the overall index, labor costs are weighted 65%; energy 15%; tax burden 10%; and office costs 10%. The index is configured so that the national average equals 100 and a local index of 105 is 5% above average. Index estimates outside of metropolitan areas are estimated by using actual unit labor costs and energy costs, but estimates of taxes and office costs based on nearby metro areas.

average purchase price per square foot for office space was 66% of the U.S. This helps support the competitive business climate in the Phoenix area, particularly against higher-cost locations in California. The office cost data is available for the Phoenix metro area, which serves as a good proxy for MAG.

A rising office vacancy rate may help keep the cost of office space down, at least in the near term. According to CB Richard Ellis, the metro-wide office vacancy rate in Phoenix reached nearly 18% during the first quarter of 2002, moderately above the 14% average seen nationwide. This marks a reversal of the mid-1990s when Phoenix's vacancy rates were below average and in the single digits. Sufficient vacant space means that rental rates should remain competitive through at least the middle of this decade. The current imbalance in favor of tenants, however, is not nearly as bad as it was at the beginning of the 1990s when office vacancy rates remained above 25% for three consecutive years.

Rising industrial vacancy rates in Phoenix may also apply downward pressure on industrial real estate costs in MAG. Industrial vacancy rates as of the first quarter of 2002 exceeded 13%, compared to under 11% nationwide according to CB Richard Ellis. Thus, available industrial space should help keep prices competitive in the near term, and generates some upside potential to attract manufacturing and distribution firms to the region.

8.1.3.4 Cost of Living

Similar to the cost of doing business, the cost of living is just moderately higher in MAG than the nationwide average. Its cost of living index, as compiled by Economy.com, estimates the cost of living in the Phoenix-Mesa metropolitan area to be 4% higher than the national average. Higher energy and transportation costs drive up the cost of living in Phoenix. This places the Phoenix metro area 40th in the nation out of 318 metro areas as calculated in 2001 based on year 2000 data. This places Phoenix higher than most peer cities in the West, including Denver, Salt Lake City and Albuquerque, but still well below most tech-related metro areas with which Phoenix competes. And, as with business costs, Phoenix is particularly competitive versus southern California.

Economy.com's housing affordability index similarly reflects costs that are equal to or slightly above the U.S. average. For 2001, an affordability index for MAG equal to 126 indicates that a median income household in the area can afford to purchase a house priced 26% above the area's median sales price. While this is good, the nationwide index, according to the National Association of Realtors, was 137.²⁷ Housing affordability is at risk in Phoenix, however, because today's seemingly high affordability is due in a large degree to low mortgage interest rates. Every year since 1995, the increase in the median sales price of single-family homes in MAG has outpaced household income growth. Thus, when interest rates begin to rise, as they will once economic recovery is in full swing, affordability may deteriorate quickly. On the whole, however, housing affordability represents neither a strong advantage nor disadvantage for the MAG region.

For migrating households from out of state, it depends upon where one is moving from, since the median sales price in MAG is nearly equal to the national average. Moving from most of the larger metro areas means moving from a higher cost market to one of lower cost. But moving from nearly any of the medium-sized metro areas in the Midwest, for example, would mean a step up in price for a house in MAG.

²⁷ The affordability index captures local median household income, the local median sales price, and the cost of taxes, insurance, maintenance, and financing. The rate has risen substantially in recent years nearly everywhere due to low financing costs.

8.1.3.5. Education and Workforce Quality

Compared to the other regions of Arizona, most indicators of education in MAG are favorable. The dropout rate was only 9.0% in 2001 according to the Arizona Department of Education, the lowest of all six regions. Further, and more importantly, academic proficiency levels in MAG are the highest of any other region in the state (see Chart 56). MAG area students demonstrated the highest proficiency in math, reading and language. Moreover, these measures of achievement are reached even as average educational spending per student in MAG is below the state average, and ranks on the lower end of the other regions. Over 57% of all the students in the state's public school system in 2000 were enrolled in the MAG region.

Workforce quality also is favorable. The 2000 census estimates the number of adults over age 25 with at least a high school diploma in MAG at 83%, above the 80% national figure. Similarly, the share of adults with a bachelor's degree at 26% is ahead of the approximately 24% nationwide average (see Chart 57).

That said, MAG lags its national counterparts in terms of educational attainment. Among the 15 largest metro areas by population (the Phoenix metro area, composed of Maricopa and Pinal counties, ranks twelfth) Phoenix ranks among the lowest in terms of population aged 25 and older with a bachelor's degree. Of the top 15, Phoenix only ranks higher than Los Angeles, Detroit, and Riverside-San Bernardino. Phoenix also comes in well behind high-tech competitors Raleigh, Austin, Denver, and Portland in terms of educational attainment.

Workforce quality is ultimately gauged by worker productivity. By this measure, MAG fares rather well. According to estimates by Economy.com, output per worker in 2001 amounted to just over \$79,000 per worker in nominal dollar terms. This is above the U.S. average of \$77,000. Moreover, MAG's productivity has improved sharply over the past half-decade in real, inflation adjusted terms (see Chart 58). In 1997 MAG overtook the national average for productivity, and the lead has widened ever since. This followed a long period between 1982 and 1997 when MAG's productivity was below average. The diversification of the economy toward an increasing share of higher-value added goods and services has transformed MAG's economy more than any other regional economy in the state. Indeed, MAG's economy is the only regional economy within Arizona that had a significant improvement in the second half of the 1990s.

Chart 56: Eighth Grade Proficiency, Maricopa County

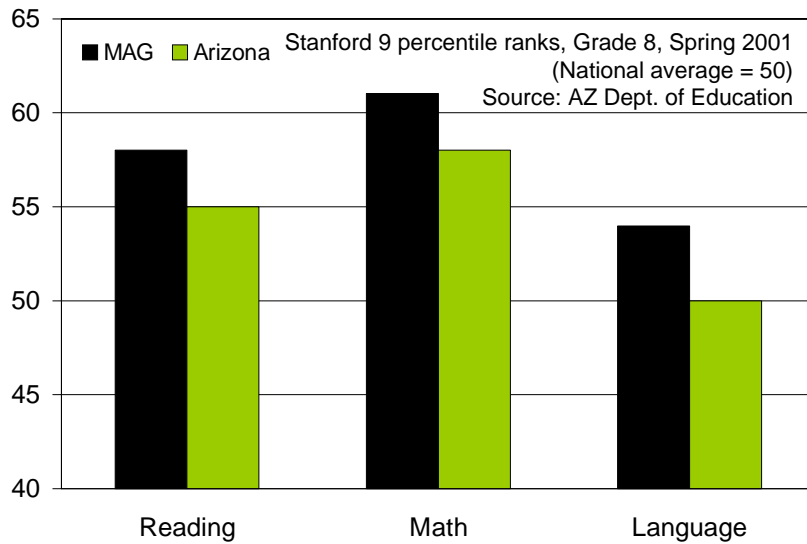


Chart 57: Educational Attainment, Maricopa County

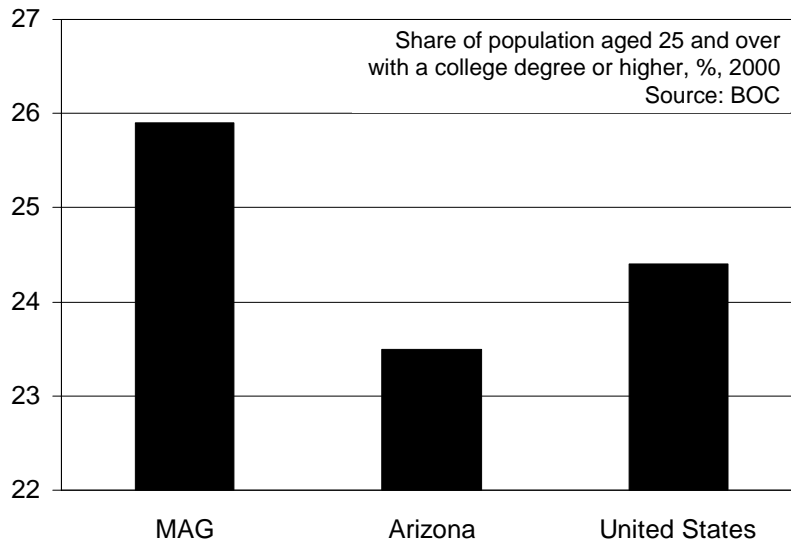
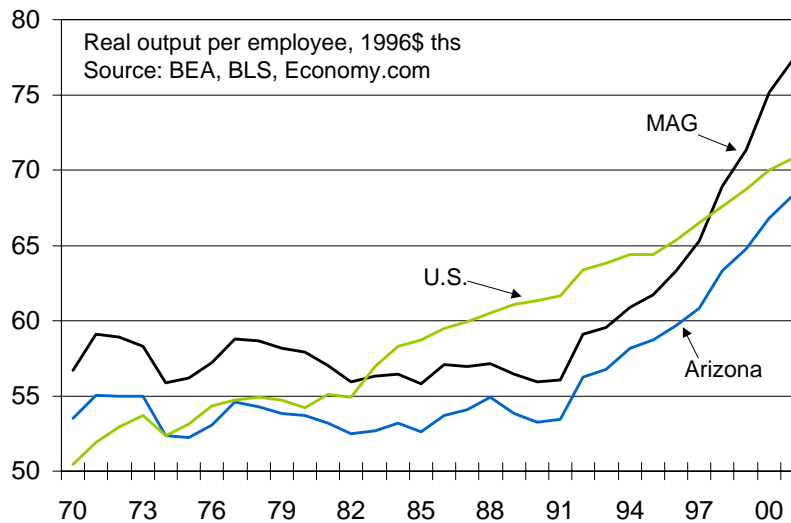


Chart 58: Productivity, Maricopa County



8.1.3.6. Health, Welfare and Crime

The poverty rate in MAG for 1999, based on the 2000 census, was the lowest in the state at 11.7%. This was also below the national average of 12.4%. MAG's poverty rate improved from 1989 by 0.6 percentage points (see Chart 59). This is about the same improvement as seen nationwide. Thus, by the broad measure of the overall welfare, MAG mirrors the national average.

By most standards, the health status of MAG residents also is equal to or better than the national average. Such measures include the infant mortality rate and the overall mortality rate (see Chart 60). One indicator of concern, however, is the region's teen pregnancy rate, which is among the highest in Arizona. Nearly 50 pregnancies are reported among females aged 15-17 for every 1,000. This is higher than the state average, which in turn is higher than the U.S. average.

Among general measures of health, welfare and crime, MAG ranks the worst for crime. This is significant since crime is usually considered an important component of quality of life, and Economy.com's models indicate that it is an important determinant of industry location. MAG's FBI crime index for 1999 of 63.7 reported crimes per 1,000 population was second only to PAG within Arizona (see Chart 61). Moreover, it is well above the national average of 42.7. To its benefit, MAG's crime rate fell significantly over the second half of the 1990s, but it also similarly improved nationwide so that the gap between the local and national rates has remained nearly constant.

8.1.3.7 Infrastructure

The MAG region has the most developed infrastructure within the state and this represents one of the most significant comparative advantages for the region in the coming years. Telecommunications access is plentiful for both telephone and broadband access. MAG is well served for water by the CAP and Salt River Project systems and, assuming that water conservation continues to make all users increasingly efficient, supplies should be adequate for the foreseeable future during normal weather conditions. However, this does not preclude years where water supplies may become critical. In any given year, there may be potential need for increased conservation.

Chart 59: Poverty Rate, Maricopa County

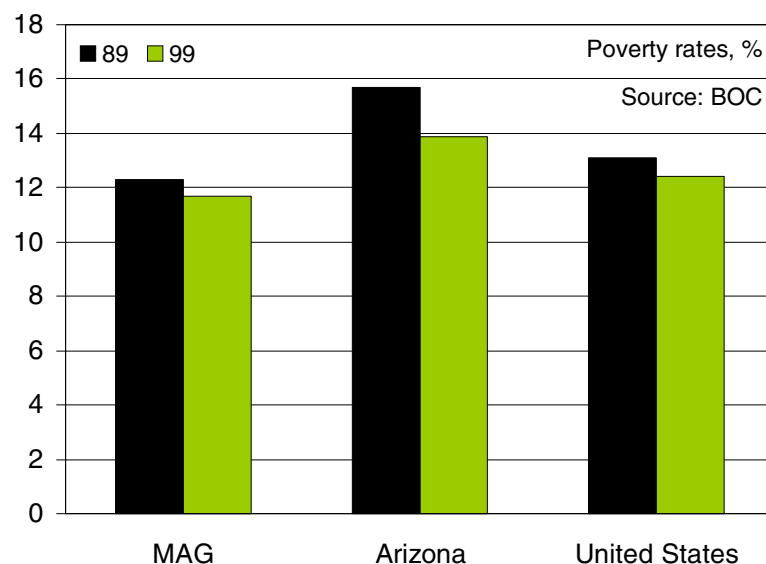


Chart 60: Infant Mortality Rate, Maricopa County

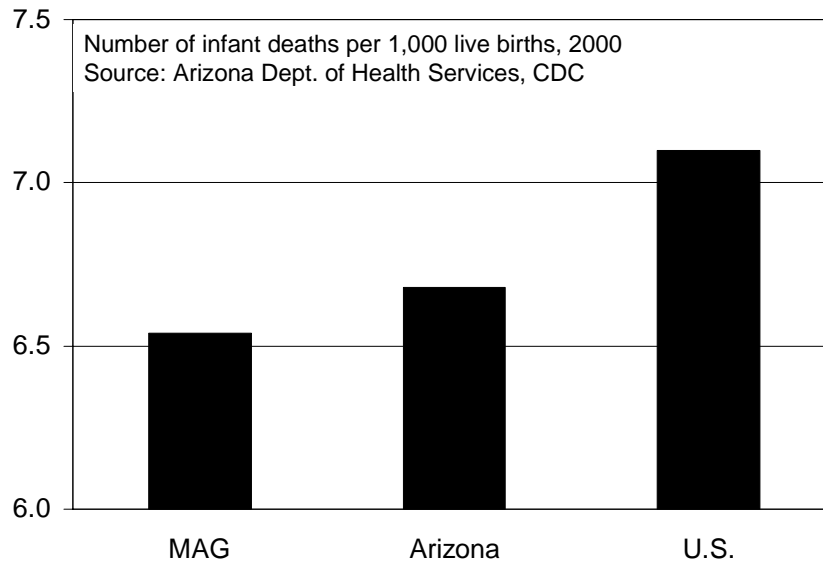
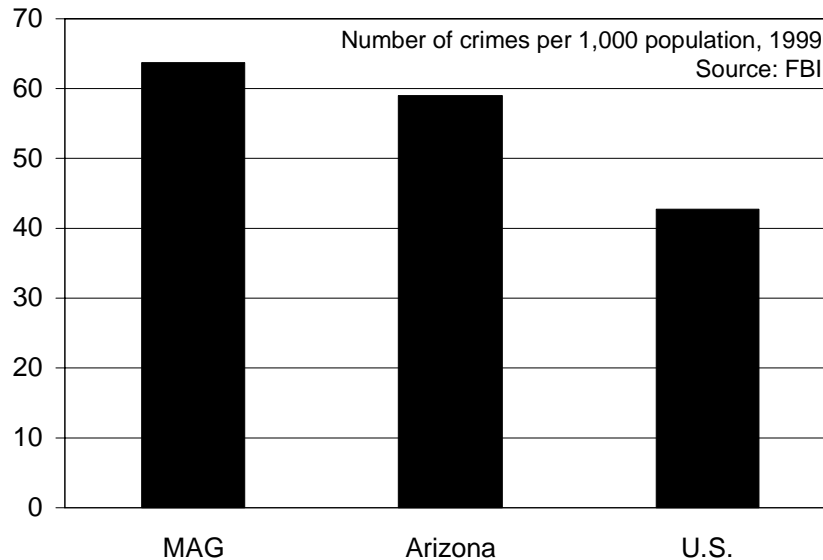


Chart 61: FBI Crime Index, Maricopa County



MAG is also served by the most completely developed highway system within Arizona. Its central access to highways I-10 and I-17 will continue to make MAG the center of the state's economy. Arizona does suffer from highway congestion at times, however. The Texas Transportation Institute estimates that highway congestion in the Phoenix metropolitan area cost the economy \$1.39 billion in 1999 (latest data) due to increased fuel consumption and time lost. This works out to about 1.3% of gross product for the metro area. It should be noted that this has not risen since 1996, although it is well above the 0.8% of gross product that congestion was estimated to have cost the economy when the TTI first created this measure in 1982.

One of MAG's greatest assets is the Phoenix Sky Harbor International Airport. Given its three parallel runways and its gate expansions in recent years, the airport has no capacity shortage for the coming decade. The only possible constraint to operations at the airport could be limitations due to increased development around the airport. Thus, in the very long term,

there may very well be a need to build a new airport on the fringe of the urban area. But for the moment, airport capacity poses no constraints to the regional economy.

Finally, Phoenix has plenty of room to expand. While there are some constraints due to Indian Reservation boundaries, there is still room to expand to the north and to the west.

Thus, infrastructure poses few barriers to the long-term growth of the MAG economy. The real challenge is to keep the pace of infrastructure development in line with the pace of population and economic growth. For example, as the Phoenix economy expands northward, there will be continued need to improve I-17.

8.1.4 Economic Opportunities

Given MAG's dominance of the state economy, its diverse structure and its relatively productive workforce, many of the state's economic opportunities remain centered in this region. First, many of its current basic industries will continue to drive the economy. Tourism-related industries will continue to support economic growth, although as the economy further diversifies, tourism will have a proportionately smaller impact on the economy. Furthermore, among its deconcentrating industries, the aircraft and parts industry has good potential to expand once again based on the expected rise in defense spending.

Among the stable industries, measuring and controlling devices has some good potential as well, although there is some risk of industry consolidation in the near term. Other stable industries are less certain. The electronics industry will have considerable competition from overseas production plants. The airline industry, while it has good long-term potential, is currently in such financial difficulty that consolidation and cutbacks in the near term cannot be ruled out.

Among MAG's growth industries, trucking and warehousing is indeed one of the industries identified with significant opportunity going forward statewide. While opportunities abound to develop the industry in the periphery of the state, MAG's central location within the state and the region means that it will continue to expand here as well. Finance, insurance carriers and miscellaneous business services also have good potential. The MAG economy is very much weighted toward service providers, and this will likely continue in the future.

Among MAG's current basic economic drivers, the dynamic industries have some of the least potential going forward. Construction activity and management and public relations will continue to be simply reflective of the overall growth rate of the economy. And tourism-related amusement services will grow as well, but its importance will not intensify. The commercial banking industry also follows the overall growth of the economy, although if more regional or national operations were to be focused in MAG, it would provide greater potential to support the economy.

Arizona's emerging economic opportunities with potential in MAG include:

- Software and Systems Design
- Healthcare/Biotech
- Communications Services
- High-tech Instruments
- Engineering Research & Testing
- Defense/Aerospace/Avionics

Software and healthcare/biotech do not appear among the current driving industries of the economy. Biotech has the most immediate potential given the successful attraction of the TGRI to Phoenix. Healthcare services has more potential longer term as well to develop into a major regional center. Links with ASU's Cancer Research Center, the TGRI, and research undertaken at the Phoenix campus of UA's Health Sciences Center provide a

good foundation for the future. Software has excellent potential based on expected strong demand nationally and globally and MAG's substantial technology-based workforce. Communications is currently a deconcentrating industry as it goes through its very deep cyclical downturn, but has good global long-term demand potential. The defense-related aerospace and avionics industries have significant upside potential, and given the need for additional R&D activity related to the development of new defense systems, demand for engineering research and testing will rise as well. And finally, medical, measuring and optical instruments already have a foothold in the economy, and should see strong demand going forward.

Constraints to the development of these industries primarily lie in funding. Each of these industries is research intensive, requiring substantial upfront funding for product/service development. But there is evidence that funding can be found. The broad public/private backing of TGRI is evidence of local support, and rising defense R&D expenditures will likely channel research funds to the area's defense contractors and related engineering firms. Software will be more dependent upon private funding sources. Healthcare will depend on continued public/private partnerships. Communications will be more subject to the vagaries of private equity markets.

8.1.5 Economic Outlook

MAG's economic outlook remains good. Economy.com's baseline forecast through 2012 projects real per capita income growth of 2.0% annually, with employment growth at 3.8% annually. MAG's productivity is expected to improve further, helping to bring its income growth rate back near the top of all of Arizona's regions. This assumes only moderate changes in the region's underlying measures of comparative advantage and industrial structure as would be expected over time given assumptions about U.S. macro and international conditions.

Changing these assumptions, however, so that measures of comparative advantage reflect the highest attainment, generates an improved outlook for productivity, resulting in projected real per capita income growth of 3.7% annually and employment growth of 4.4% per year. On the downside, shifting assumptions of comparative advantage to the lowest attainment nationwide brings per capita income growth down to just 0.8% per year, with employment growth dropping to 3.3% per year.

8.1.6 Foundational Issues

The MAG economy has fewer underlying foundational constraints than the other regions of the state. Overall, the primary issue going forward will be to improve quality of life factors that the area can continue not only to attract top level workers, but also to retain them over the long term. Thus, there is the need to continue to improve upon the cultural infrastructure of the Phoenix area through the various arts, entertainment and recreational resources that currently exist. Similarly, as the metropolitan area continues to grow, the physical infrastructure will have to keep pace to manage the inevitable increase in population and congestion. MAG's crime rate is one of the one of its least favorable aspects of the area's quality of life, and while it may not be visible to many, the data indicate that it has the potential to detract from the area's livability over the long term. Thus, one of the greatest challenges will be to further enhance the Phoenix area's quality of life for its residents of all demographic and economic groups.

8.2 Pima Association of Governments (Pima County)

8.2.1 Current Economic Trends

Economic conditions in PAG appear to be stabilizing following its mild recession of 2001. PAG's manufacturing employment did contract through the recession, but not as deeply as elsewhere in Arizona. This is due, in part, to PAG's reliance on defense-related manufacturing, which weathered the manufacturing recession better than other industries. Similarly, the stability of military bases and the large university presence relative to the overall size of the economy helped buffer it from the worst of the recession. One indicator of a rebounding economy is an improving unemployment rate, which has edged down moderately from its peak in February and remains more than one percentage point below both the state and nationwide averages.

Going forward, PAG's defense-related industries will benefit considerably from the accelerating federal defense procurement budget. The proposed procurement program will be used to acquire cutting edge reconnaissance systems, communications and imaging devices, guidance systems and weapons, all of which fall within the expertise of PAG's defense contractors such as Raytheon, Universal Avionics, Sargent Controls and Honeywell. Tucson's technology-based industries such as optics and biotechnology add further upside potential to the economy. There should also be a firming of tourism spending going forward as regional and national income growth improve coming out of last year's recession.

8.2.2 Industrial Structure

Leading and lagging basic industries. PAG's industrial structure includes a number of dynamic technology-based industries that have driven the economy over the past decade (see Table 20). They include the manufacture of aerospace equipment and related electronics, and research and testing services that are linked to tech-based production as well as to university research. Technology-based services such as computer and data processing are also included in the dynamic category, as are personnel supply services. To be sure, both of these service categories are a little ambiguous in terms of their technology concentration. Computer and data processing include both computer programming as well as the less tech-intensive data processing industry. Personnel supply services provide temporary workers to a variety of industries, which can include technically trained workers for manufacturing and services as well as general clerical and production workers. The rising number of temps, however, illustrates the increasing use of a flexible workforce, a phenomenon that is increasingly evident among technology-based industries.

Other dynamic service providers include medical service and health insurance carriers and management and public relations. The insurance carriers illustrate PAG's emerging role as a back-office service center. Management and public relations is a broad category that illustrates the increased amount of outsourcing of business support services.

Special trade contractors are included in the dynamic group. Construction is not technically a basic industry but is reliant on the growth of other basic industries that require new building construction to support their operations. Special trade contractors include the plumbers, electricians, masons and the like that are needed for both residential and nonresidential building construction.

A significant characteristic of PAG's dynamic industries is the preponderance of tech-based manufacturing. No region appears to be driven as much by such industries as is PAG. This industrial structure offers great potential for the economy and the income that

Table 20: Characteristics of PAG's Basic Industries

Dynamic Industries

376	Guided missiles, space vehicles and parts
381	Search and navigation equipment
632	Medical service and health insurance carriers
736	Personnel supply services
737	Computer and data processing services
873	Research and testing services
874	Management and public relations

Growth Industries

none

Stable Industries

102	Copper mining
17	Special trade contractors
58	Restaurants
70	Hotels and lodging
GVF	Federal government
GVML	Military
GVS	State government

Deconcentrating Industries

65	Real Estate
79	Amusement and recreation services

Note: PAG consists of Pima County

it can produce, although it also generates some risk of volatility that may accompany the pace of technology development and adoption.

PAG is also somewhat unique in that there are not any industries categorized as growth industries. There is a relatively large number of dynamic industries and similarly some large stable industries, but none fit the category between them with job growth over the past decade between 6% and 8% annualized rates and a location quotient growth rate of greater than 1% annualized.

While the dynamic industries generate some potential for volatility, PAG's stable industries illustrate much of the foundation of the economy that contributes to its long-term stability. Copper mining is, perhaps, PAG's most fundamental basic industry that has exploited a major resource in the county for many years. Federal civilian and military employment further add to the stream of income to the region that is generated elsewhere. State government is indicative of the large role of the University of Arizona in PAG's economy. Both federal and state government should remain stable employers, with some upside potential from the military. Restaurants and the hotel and lodging industry represent the important role of tourism and travel in the area.

Deconcentrating industries are few in PAG. As with the statewide economy, real estate is a deconcentrating industry. Much like construction, real estate is not usually associated with the basic economy, but like construction, has a large location quotient because of PAG's population growth of nearly twice the nationwide average. The fact that real estate is a deconcentrating industry, however, is illustrative of the long-term broadening of the economy combined with the area's slower population growth over the second half of the 1990s. Amusement and recreation services are also deconcentrating. Employment in this

industry did increase over the 1990s, but its share of the total employment base barely rose during the second half of the decade.

PAG's industrial structure, with a diversity index of 0.35, is the second most diverse in the state following MAG (see Appendix). Its relatively high concentration of government-related employment (including the university), high-tech and defense related manufacturing industries, and its military presence create an industrial structure significantly different from the U.S. It is also different from most metro areas of its size. While the Tucson metro area (Pima County) is the 74th largest by payroll employment, its diversity index ranks 148th and metro areas in its size class (31 metro areas between 285,000 and 552,000 jobs) have diversity indexes averaging 0.44.

8.2.3 Measures of Comparative Advantage

8.2.3.1 Population

PAG's population growth is well above the national average, expanding by 27% over the past decade according to the 2000 census, equal to a 2.4% annualized rate (see Chart 62). While high, this pace of growth is well below the statewide average and PAG is the second slowest growing area in the state, above only SEAGO. Positive migration fuels PAG's growth, although it is not nearly as important a factor as elsewhere in Arizona. Population growth has, in turn, supported growth of non-basic industries such as retail and personal services. While PAG does have some physical constraints such as topographical barriers and infrastructure limits, PAG is expected to post above average (for the U.S.) population growth over the forecast horizon.

PAG has a somewhat high share of both elderly and young residents. PAG's share of residents aged 65 and over, 14.2% according to the 2000 census, is the third highest among all the COGs. It is only slightly above the 13% statewide average, but is more significant given that the University of Arizona has close to 35,000 students in the area. Thus, there is a remarkable diversity of population in PAG that includes retirees and students as well as workers in both government and private enterprise.

8.2.3.2 Income

PAG boasts stable income trends with real per capita income growth over the past decade about equal to the statewide average according to the decennial census (see Chart 63). It trailed CAAG and NACOG during the 1989 to 1999 period, but it did slightly outpace MAG, giving it the third highest income growth rate in the state. The area's roster of high-tech, high value-added manufacturing enterprises helped to keep income growth strong during the 1990s and improve its growth rate over the previous decade. PAG's per capita income of \$19,800 in 1999 was just behind the statewide average and ranked second among the regions. It was still more than 10% under top-ranked MAG, however.

Due to PAG's population distribution, its per capita income is likely biased downward by the large number of students and retirees who usually live on smaller incomes than do full-time workers and their families. Using annual income estimates from the BEA and employment data from the BLS, total personal income per worker in PAG is less than 1% below that in the MAG region.

8.2.3.3 Cost of Doing Business

Economy.com ranks the cost of doing business in PAG at nearly 6% above the U.S. average, and the highest among Arizona's regions (see Chart 64). The higher ranking

Chart 62: Population Growth, Pima County

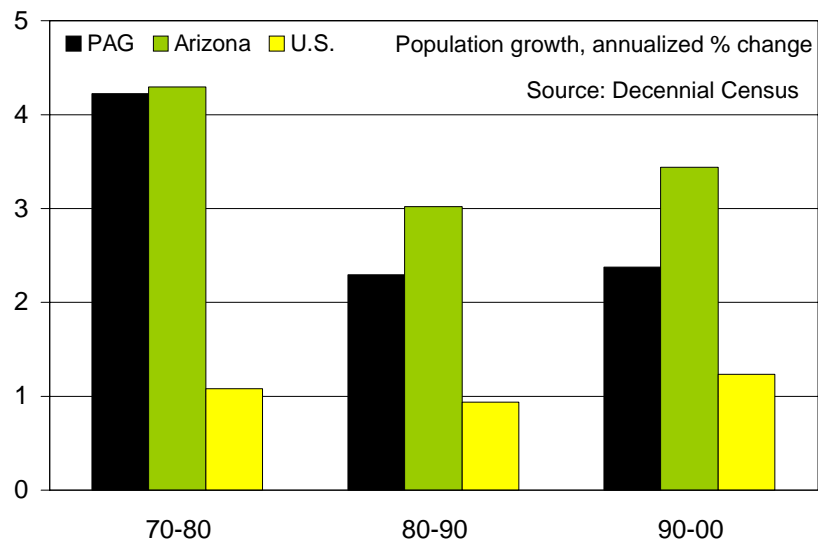


Chart 63: Income Growth, Pima County

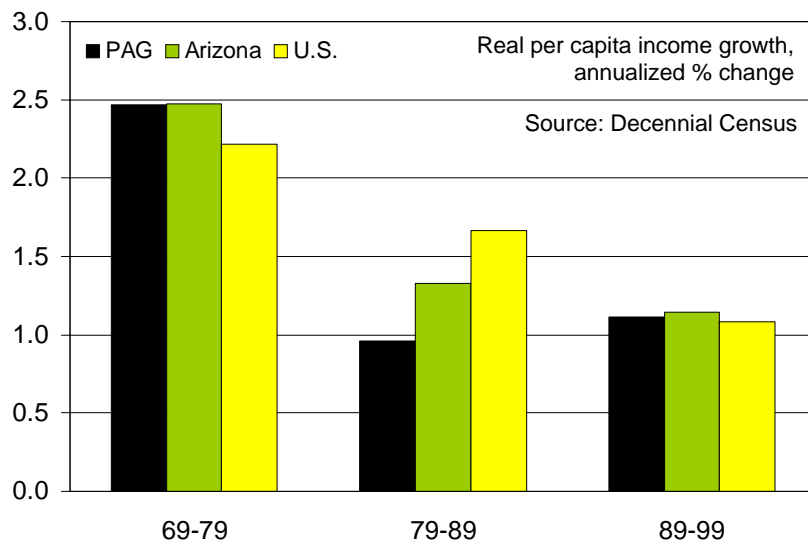
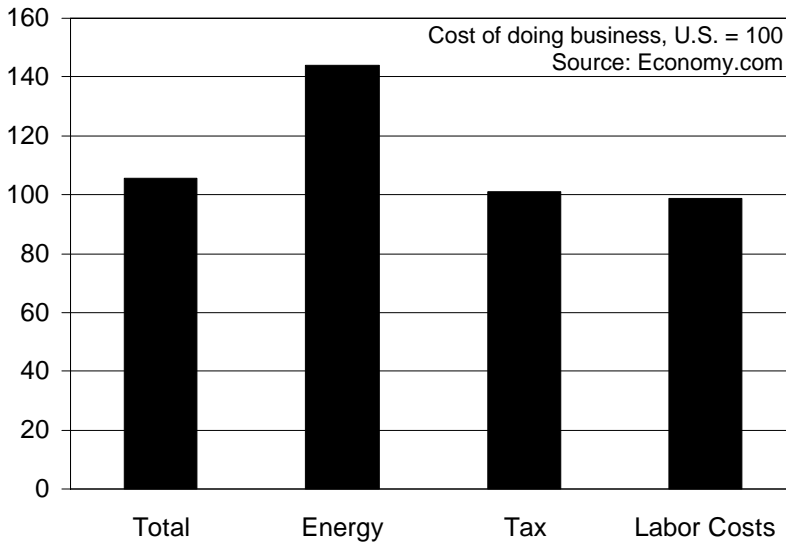


Chart 64: Cost of Doing Business, Pima County



is due solely to higher energy costs in the area than elsewhere in the state. It should be noted, however, that PAG's energy and other business costs are still well below California's costs, and energy is not in short supply in PAG. But overall, the cost of doing business in PAG is only a small negative factor for its economic outlook.

Low office rental rates help offset the area's high energy costs. PAG enjoys below average real estate costs, as measured by low office rental rates, especially compared to other high-tech centers across the nation.²⁸ These low office space costs contribute significantly to improving PAG's competitive business climate. As with most metropolitan areas around the country, rising office vacancy rates through early 2002 are helping to stem increases in office rental rates further. As of the first quarter, PAG's office vacancy rate had risen to 11% from a low of 6.4% in early 2000. The current rate remains below the national rate of 14% and illustrates the fact that the vacancy situation is more critical in some of the larger tech centers such as Silicon Valley and Dallas, where rents had risen quite rapidly, and have since fallen. Thus, the gap between low cost areas such as in Tucson, and higher cost tech centers, is narrowing, shrinking some of the area's relative cost advantages.

8.2.3.4 Cost of Living

The cost of living in PAG is on par with the rest of the nation, and markedly lower than in MAG. PAG's average rate ranks it 76th in the nation out of 318 metro areas. The area's living costs did rise over the course of the 1990s, although it did moderate during the decade's final two years. Tucson has relatively low costs for consumer goods and housing, but higher utility costs in the metro area place upward pressure on living costs. PAG places lower in terms of living costs than most peer cities in the West, including Denver, Salt Lake City and Albuquerque. PAG thus remains a competitive area, particularly versus high-cost areas in southern California.

Housing affordability in the PAG area is good, but not nearly up to the national average. According to Economy.com's housing affordability index, a household in the region earning the median household income can afford to purchase a house priced 16% higher than the median-priced home. But this is below the national average of 37%. So while the affordability is good, it is not quite as good as elsewhere in the U.S. Indeed, the index may be biased downward, much as is the personal income data, due to the large student population. The homeownership rate for Pima County in 2000 was 64% according to the census, just two percentage points under the national average.

8.2.3.5 Education and Workforce Quality

Most education indicators in PAG are on par with state averages. Stanford 9 scores for eighth graders are slightly above the statewide average for reading and language and just below for math (see Chart 65). Average spending per student in PAG is above the state average and is second highest in the state. The dropout rate among PAG students, however, was 11.0% for the 2000-2001 school year, which was slightly above the state average of 9.8%, and more than twice the national average.

As is the case throughout Arizona, measures of overall educational attainment and spending lag behind national norms. But performance measures are at least on par with the statewide average. And as with much of the rest of the state, in-migration makes up for some of the weaknesses of the homegrown workforce. The 2000 census estimates that over 83% of the population have a high school degree, versus just over 80% nationwide. Nearly 27% have a college degree, also ahead of the national average of over 24% (see Chart 66). The presence of the University of Arizona certainly attracts a well-educated stream of migrants and helps to retain them.

²⁸ Office rental rates are available for Arizona's metropolitan areas. In the case of MAG, this region is the same as the Tucson metropolitan area.

Chart 65: Eighth Grade Proficiency, Pima County

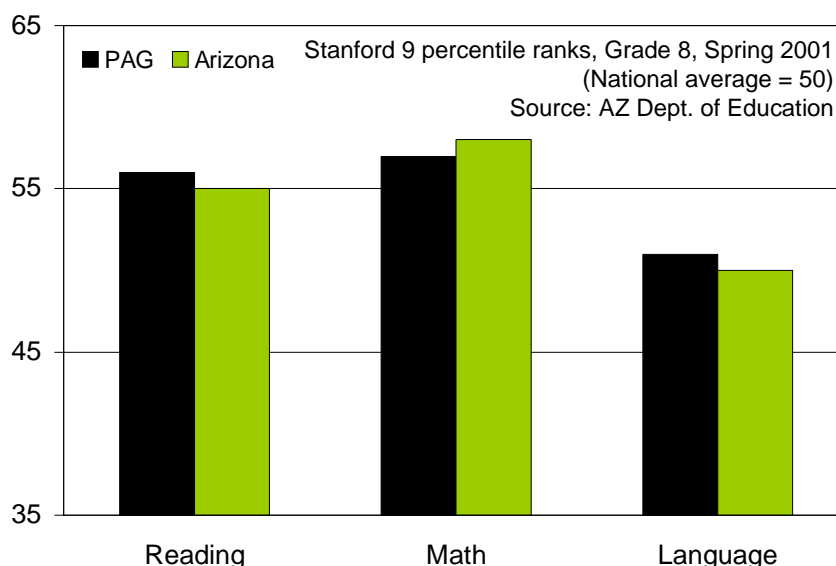
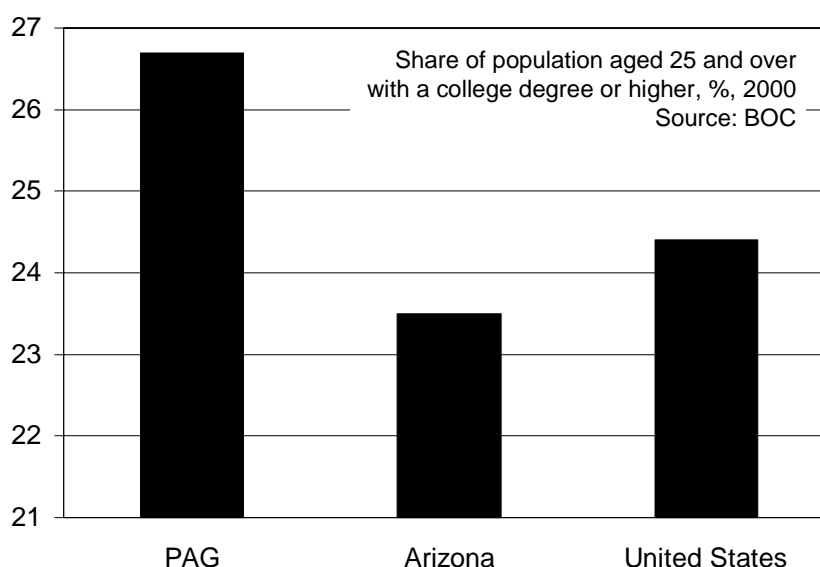


Chart 66: Educational Attainment, Pima County



Despite the presence of the university and the educational attainment of the population, workforce productivity in PAG still lags behind nationwide and statewide trends (see Chart 67). Productivity, as measured by gross product per payroll worker, did indeed rise steadily over the 1990s, but the increase was slower than elsewhere. Part of the reason for this may very well be a difficulty in estimating true output for the large government employers in the PAG region. While the output of their workforces may be rising rapidly, their salaries, which is the primary indicator of government output, are not likely rising as quickly.

8.2.3.6 Health, Welfare and Crime

The poverty rate in PAG of 14.7% is about equal to the statewide average (see Chart 68). Only the MAG region has a lower rate within Arizona. The rate did improve over the course of the last decade, as it did throughout Arizona. PAG's improvement was a little bit better than most, falling by 2.5 percentage points, while Arizona's overall rate fell by

Chart 67: Productivity, Pima County

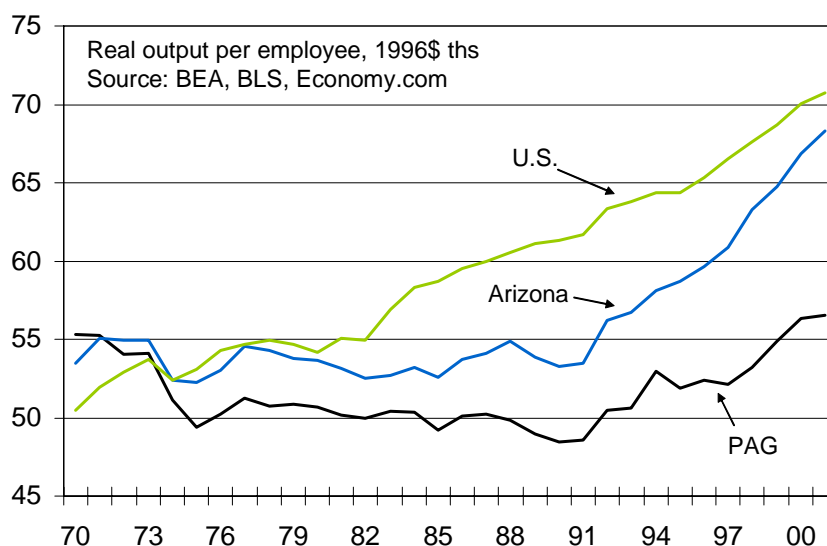
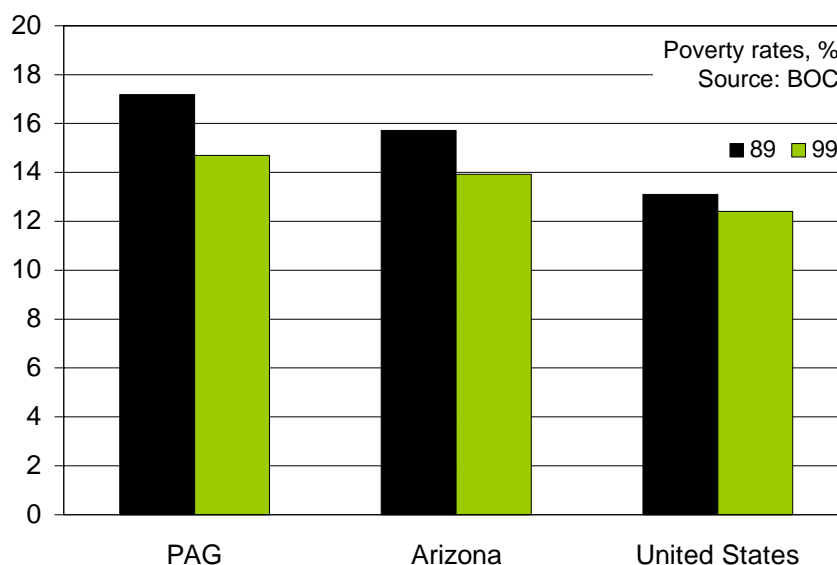


Chart 68: Poverty Rate, Pima County



just 0.7 percentage points. Thus, by standards of both poverty and per capita income, the overall welfare of the PAG population did improve during the 1990s.

By most standards, the health status of PAG residents also is on par with residents around the state. Indeed, PAG's infant mortality rate for 2000 of just 6.1 per 1,000 live births was below state and national norms (see Chart 69). However, the region has one of the highest teen pregnancy rates in the state; nearly 49 pregnancies were reported among females aged 15-17 for every 1,000 residents. This is higher than the state average, and is especially worrisome considering the state itself has a higher than average teen pregnancy rate compared to the rest of the nation.

Crime rates in PAG are extremely high. The rate of 68 violent crimes per 1,000 population is the highest of any of Arizona's regions and well above the national average of 41. PAG suffers an exceptionally high homicide mortality rate, also the highest of all Arizona regions. Thus, a high crime rate and a high teen pregnancy rate, which are often used as indicators of social wellbeing, dampen somewhat the perceptions of quality of life in the PAG region (see Chart 70).

Chart 69: Infant Mortality Rate, Pima County

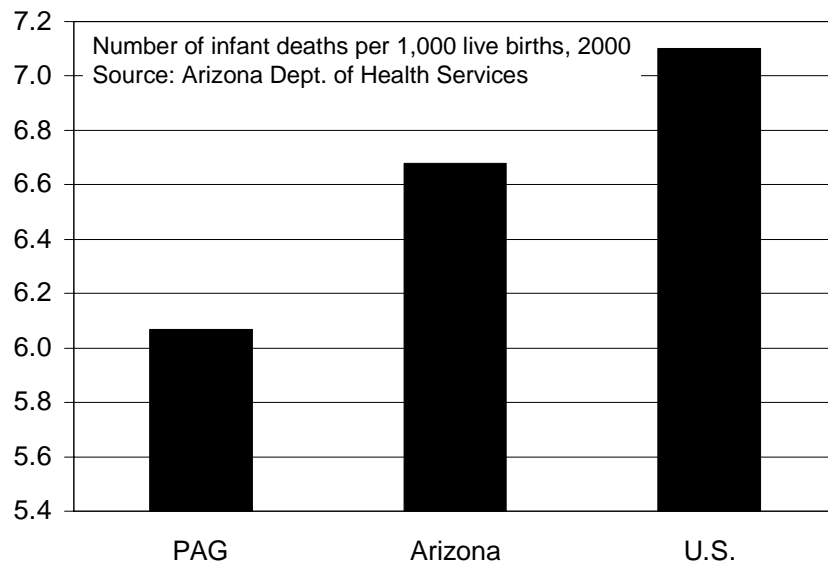
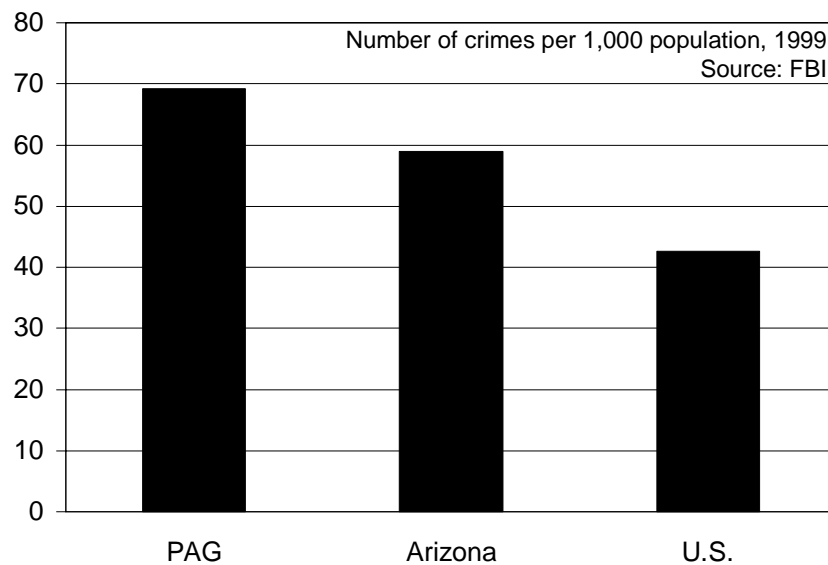


Chart 70: FBI Crime Index, Pima County



8.2.3.7 Infrastructure

Infrastructure does pose some risk for the PAG economy in the coming years. As nearly everywhere in Arizona, the fast pace of population growth puts high demands upon all infrastructure and creates constant demand for expansion and improvements.

Water will be problematic in the future as not all of PAG is served by CAP water, and groundwater remains a major source for the area. But given limitations of groundwater supply, this cannot be counted on to support future population growth.

Highway access also poses some long-term challenges. While I-10 and I-19 meet in Tucson, providing good access to the rest of the state and to Mexico, there is little in terms of bypass infrastructure to travel around the urban area. Moreover, as the local street grid expands, there are limited expressways or local freeways to speed traffic around the urban area. Thus, there is great potential for rapidly increasing congestion as the metropolitan area economy expands in the years to come.

8.2.4 Economic Opportunities

Tucson's preponderance of technology-based industries and the research undertaken at the university and among its private employers present many opportunities for the economy going forward. All of its dynamic industries continue to hold very good potential within the macro and international economic conditions expected in the coming decade. Moreover, its stable industries, which include primarily state and federal workers, should remain a stable part of the economy, as will components of tourism. Even federal employment has some potential to expand given the expected expansion of the U.S. Border Patrol over the next several years. Indeed, the current economic structure of PAG is most likely the best positioned among all of the regions to take advantage of current resources and comparative advantages within the region.

Arizona's emerging economic opportunities with potential in PAG include:

- Software and Systems Design
- Healthcare/Biotech
- Communications Services
- High-tech Instruments
- Engineering Research and Testing
- Transportation/Logistics
- Defense/Aerospace/Avionics

Software already has a dynamic presence in the area as indicated by the rapid growth of computer and data processing services. The industry is closely linked to the area's high-tech manufacturers that outsource many of their software needs. Healthcare/Biotechnology has tremendous potential due to the presence of UA's Medical School and Health Science Center, along with the numerous research centers and institutes affiliated with the medical school and the university. The addition, research spinoffs anticipated from collaboration with the TGRI further enhance the potential for Tucson's healthcare industry to become a world class center serving the Southwest, Mexico and broader markets. High-tech instruments similarly have a foundation in the area's optical instruments research and there is potential for the industry to expand beyond optics to medical, measuring and other types of instrumentation. Research and testing would be a vital component of the entire high-tech economy that is emerging in the PAG region.

As the southern-most major metropolitan area in Arizona, located on the first major junction of interstate highways north of the Mexican border, the logistics and transportation industries have a very good opportunity to expand in the area as trade with Mexico expands. As Mexican manufacturers shift farther south toward a more plentiful labor supply, Tucson also becomes more than just a junction near the border. If border clearances are significantly improved in the coming years, Tucson will be about one day's drive from several major Mexican cities and a logical stopping and transshipment location.

Finally, the defense/aerospace/avionics industries will expand with the rising defense budget. They will likely undertake expanded research and development work in the near term and manufacturing over the long term to meet the evolving needs of the defense department and homeland security. The obvious driver of the industry is for defense-related procurements that should bolster Raytheon, Universal Avionics and other defense-related contractors. But Bombardier's operation in Tucson should also see improved demand for its services related to private aircraft and regional civil aviation jetliners meeting demand for expanding point-to-point routes between mid-size markets.

Most of the economic opportunities identified here are similar to the priority industries that have been identified by the Greater Tucson Economic Council. GTEC's list is broader and also includes environmental technology and advanced materials. The list in this report is not meant to exclude these at all, and indeed, there are linkages between these industries and the economic opportunities related to high-tech instruments and research and testing services. The greatest advantage for PAG going forward is its confluence of technology-based industries and accompanying research and development taking place at both public and private research labs. The area has been quite able to attract a skilled workforce to support such endeavors.

Constraints that could arise include the need to attract further research funds that may support the expansion and diversification of PAG's technology base. Moreover, the defense-related industries do face some risks since the future needs of defense and homeland security are not yet well defined. Thus, private sector R&D will be equally important to ensure that PAG's defense-based industry does indeed earn future procurement contracts.

8.2.5 Economic Outlook

PAG's outlook is among the strongest of Arizona's regions. Economy.com's baseline outlook projects real per capita personal income to rise by 2.0% per year over the 2002 to 2012 period. This is equal to the growth rate expected in the MAG region and stronger than any other region in the state. The concentration of high-value added industries, and the potential for continued improvements in productivity keep the income forecast strong, even though the outlook for employment at 3.0% per year is slightly below average. Its current dynamic industries have the potential to continue to drive the economy, with many opportunities to expand and diversify in the coming decade. The forecast assumes that the dynamic industries will continue to play an important role in the economy.

Despite the positive outlook for the economy, the projections are responsive to shifts in the assumptions of comparative advantage. Improving the five factors described in Section 6 causes the outlook for real per capita income to rise to a 3.8% growth rate. Employment similarly rises to a 3.0% rate under the high assumptions scenario. Under assumptions of deteriorating comparative advantages, real per capita personal income growth could fall to as low as 0.9%, and employment growth would slow to a much more moderate 2.5% over the coming decade. Under the baseline, high and low assumptions, however, PAG's forecast for real per capita income growth remains top-ranked within the state at about the same rate as MAG.

8.2.6 Foundational Issues

As in the rest of the state, K-12 education is a critical foundational issue. Through the University of Arizona, there is a constant attraction of skilled migrants to the area. But as elsewhere, the K-12 education system still underperforms when measured against national standards. Proposition 301 funds should be able to support further improvements in K-12 education and to broaden research opportunities at the University of Arizona. This is the first step in the right direction to continue to support PAG's industries and to provide wide opportunities to its endogenously trained workforce.

For technology to continue to expand, there will be a need for financing through venture capital, other private sources, and public sources as well. It will be incumbent upon both public and private policymakers to make sure that local entrepreneurs have sufficient opportunities to consistently catch the attention of investors as they develop new products and services.

As in the MAG region, there is also some potential to further develop local tourist resources that can benefit the quality of life of local residents as well to increasingly retain the skilled labor that is attracted to the area by its industries and research opportunities. Expanded activities related to culture and the arts would have great potential given resources at the university and given the broad cultural diversity in the entire PAG region.

8.3 Northern Arizona Council of Governments (Apache, Coconino, Navajo and Yavapai Counties)

8.3.1 Current Economic Trends

The NACOG economy continues to expand at a very slow pace. The region did avoid falling into recession last year, although its payrolls are expanding at a decelerating pace. Much of the region's stability comes from the stable government payroll, which accounts for almost a third of all employment in the region. Unemployment in NACOG is holding steady at its above-average rate. It is difficult to make broad generalizations about this geographically large and economically diverse region of the state. For example, estimated unemployment rates range from between 3% and 4% in Yavapai and Coconino counties to approximately 10% in Navajo and Apache counties. Moreover, the Arizona Department of Employment Security estimates that employment continued to rise through the first half of 2002 in Yavapai County, it remained largely unchanged in Coconino County, but fell by approximately 3% over the year in Navajo and Apache Counties.

Economic activity in NACOG is concentrated in Yavapai and Coconino counties, which together account for about 75% of the payroll employment in the region. Economic activity is particularly concentrated around Flagstaff and Prescott, and to a lesser extent, around the Showlow/ Pinetop-Lakeside areas. NACOG's narrow manufacturing base has helped it avoid the manufacturing recession that triggered the national and state recession last year. Furthermore, the region still experiences strong population growth, particularly in Yavapai County. Resilient growth in services and retail trade in the region is supported by demand generated by in-migration.

The greatest impact of the 2001 recession on the region was a moderate reduction in tourist visits. Grand Canyon visitation was down almost 7% in 2001, but this downturn was modest compared to some rather dire projections in the immediate aftermath of the 9/11 attacks. While hotel room occupancy has improved since then, room prices have not been so robust. The outlook for tourism is positive however, as travel demand, particularly related to auto travel, has shown some resiliency. Already through this spring conditions in the local lodging and retail industries have firmed.

Apache and Navajo Counties were hit the hardest by last year's recession. The DES estimates that employment through mid-year was down by 3% in each county. Government employment and government enterprises make up a significant portion of payroll employment in the region.

8.3.2 Industrial Structure

Leading and lagging basic industries. As mentioned above, the industrial structure of the region is limited. The dynamic industries are limited to small manufacturing industries such as medical instruments, which can be traced to one single firm in the region (W.L. Gore), or to small miscellaneous manufacturing related to items for the tourist trade (see Table 21). A third industry, real estate agents, simply reflects the strong population growth in Yavapai County, and to a lesser extent in Coconino County. There are no industries that fit into the category of growth industries.

Table 21: Characteristics of NACOG Basic Industries

Dynamic Industries

- 38 Medical instrument manufacturing
- 39 Miscellaneous manufacturing (jewelry, toys)
- 65 Real Estate

Growth Industries

none

Stable Industries

- 102 Copper mining
- 120 Coal mining
- 17 Special Trade Contractors
- GVF Federal Government
- GVS State Government

Deconcentrating Industries

- 24 Lumber and wood products manufacturing
- 58 Restaurants
- 70 Hotels and lodging

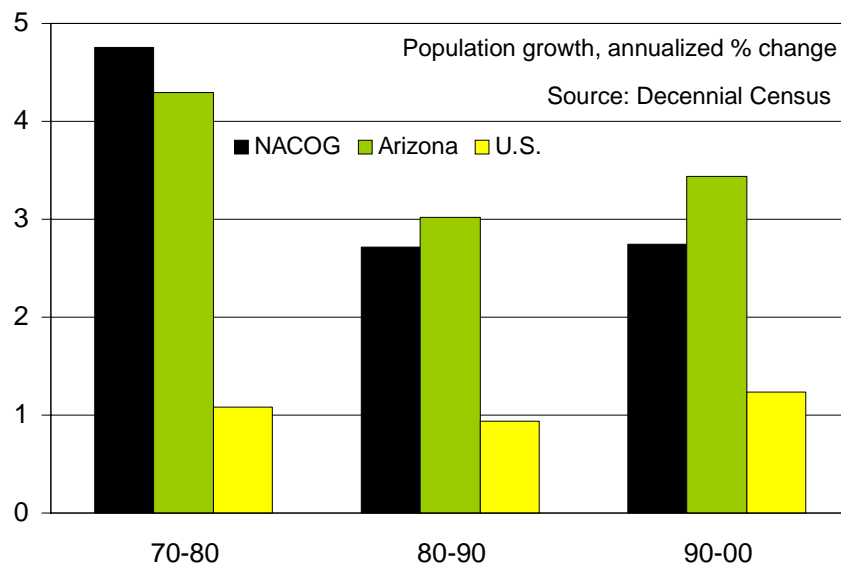
Note: NACOG consists of Apache, Coconino, Navajo and Yavapai Counties

Stable industries are dominated by federal and state government payrolls. The federal government includes the National Park Service, the U.S. Forest Service, the Bureau of Land Management, the Bureau of Indian Affairs and others that manage activities and services among the broad federal land holdings and Indian reservations in the region. State government employment is concentrated at Northern Arizona University. These agencies provide much stability to employment and income in the region, although by their very nature they do not create a lot of dynamism for the regional economy.

The tourist-based industries of restaurants and hotels and lodging appear in the deconcentrating category, although this is a function of a recent downturn in 2000 and 2001, rather than a long-term trend, as hiring in the industry slowed in response to some overbuilding and the impact from the recession. Longer term, the industry should be at least a stable industry, with some potential to do even better. Finally, the lumber and wood products industry is also a deconcentrating industry as opportunities to take advantage of forest resources have been limited within U.S. Forest Service lands.

NACOG lacks the diversity that is seen in MAG, and to a lesser extent in PAG. Its diversity index for the region is only 0.07, which is on par with Arizona's other less urbanized areas (see appendix). It is however, quite low compared to the national average. The region's diversity index, however, masks significant regional differences within NACOG. Coconino County's index, for example, of 0.47 is higher than Pima County's 0.35. Yavapai County is lower at 0.18 and Navajo County's index is a very low 0.07. Apache County's diversity index is so low that it does not register when using two digits. The very low diversity indexes illustrate the narrow economic structure of NACOG's rural areas.

Chart 71: Population Growth, Northern Arizona



8.3.3 Measures of Comparative Advantage

8.3.3.1 Population

The 2000 census reported a 31% increase in population between 1990 and 2000. This is a robust annualized rate of 2.8%, well above the national average of 1.2% (see Chart 71). By Arizona standards, however, NACOG ranks just fourth among the six regions. Here again, the differences among county performance are great. Yavapai County, which accounts for about one-third of the region's total, has seen population growth average more than 4% or more annually not just for the past decade, but for the past three decades. Elsewhere, Navajo County saw population growth of 2.3% annually during the 1990s; Coconino County was 1.9%; and Apache County was the slowest at 1.2%.

Yavapai County depends on a constant stream of migration to support its strong population growth. Elsewhere in the region, however, migration is less important. Revised migration data are not yet available for the 1990s, but the Census Bureau estimates that net migration was actually negative for Coconino and Apache Counties in 2001, and moderately positive for Navajo County.

The rapid growth of Yavapai County is supported by retiree migration. The 2000 census indicates that the population over 65 years of age accounts for 22% of the population, well above the 13% statewide average. The other three counties in the region have relatively young populations, however, caused by the presence of the NAU student body in Flagstaff. High birth rates in Navajo and Apache counties keep their populations younger than average.

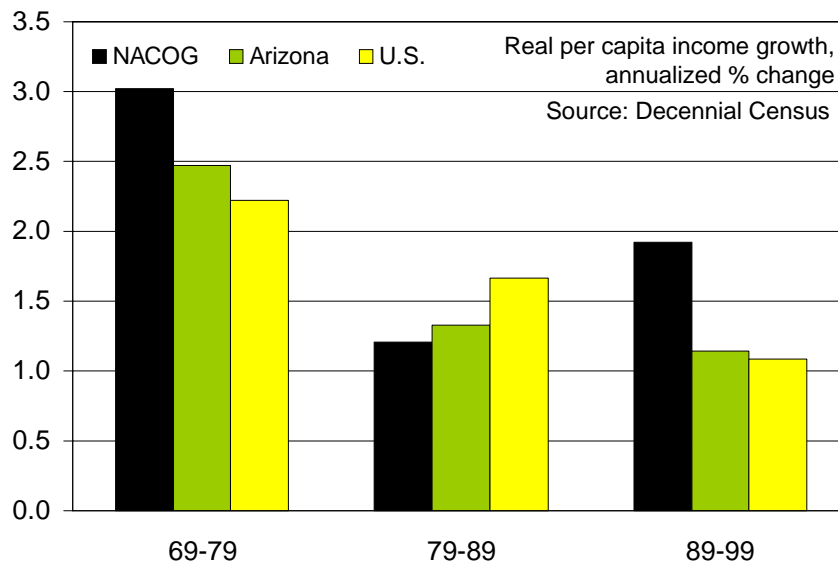
8.3.3.2 Income

Income trends also vary greatly by county within NACOG. The region as a whole ranks well below the statewide average for per capita income. But the 2000 census indicates Yavapai's income of \$19,700 per capita in 1999 to be nearly equal to the state's figure. Coconino is just below at \$17,200. Navajo and Apache Counties, however, rank at the very bottom for all 15 Arizona counties at \$11,600 and \$9,000, respectively. Their relative remoteness, lack of retiree wealth, and limited employment opportunities contribute to low incomes.

While income distribution is quite uneven throughout the region, the growth of income across the four counties was rather uniform during the 1990s. Real per capita income growth averaged nearly 2% per year across the entire region, and this was the second fastest growth rate, behind only the CAAG region (see Chart 72). Thus, while income may be low in the more remote areas of the region, there has been some improvement.

Credit quality is generally good in the NACOG region. It has the lowest number of personal bankruptcy filings per household in the state, almost half the statewide average and well below the national average. However, credit quality is eroding. The growth in the number of bankruptcy filings has been extremely high in NACOG, one of the highest in the state, over the past year.

Chart 72: Income Growth, Northern Arizona



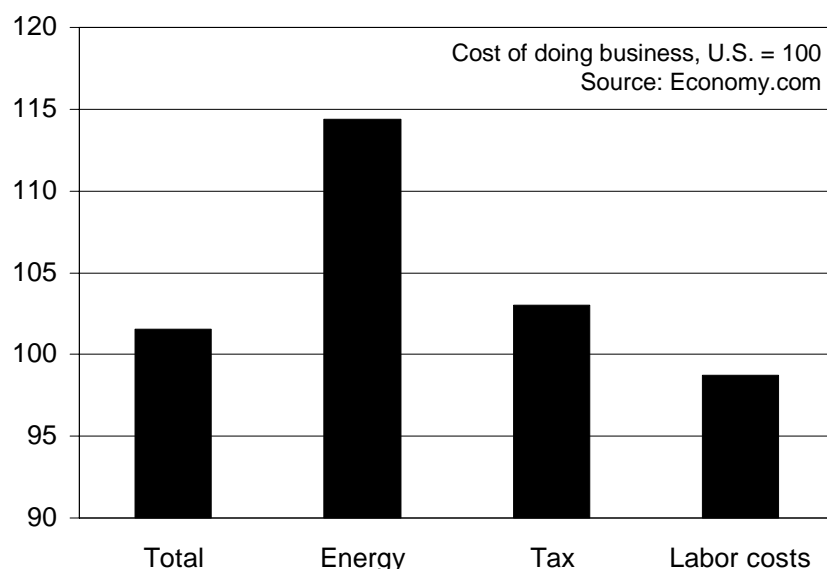
8.3.3.3 Cost of Doing Business

Like most of the state, the cost of doing business is very near average for the U.S. (see Chart 73). In fact, were it not for the above average energy costs, the region would boast an overall index below average.²⁹ The tax burden component of the index is slightly above the national average and the statewide average as well. This is because the tax burden is normalized by dividing total tax revenue in the region by total personal income. The region's low personal income thus raises the index moderately. The region also has rather moderate costs for office space rental. This varies rather widely across the region with higher costs in the Flagstaff area and lower costs elsewhere. The bottom line, however, is that the cost of doing business presents neither a major barrier to the region's economy, nor is it a particular advantage.

It should be noted that the components of the cost of doing business may not adequately capture some of the special characteristics of the NACOG region, particularly as it relates to the cost of renting office space. Costs can vary greatly. For example, in and

²⁹ The energy cost component of business costs is derived using data on rates charged by the largest utility company in the region to industrial users.

Chart 73: Cost of Doing Business, Northern Arizona



near Flagstaff where so much land is federally owned and developable land is limited, office space is considerably more expensive and hard to find. In the more remote regions, and particularly on the Indian reservations that have their own systems of land ownership, it also may be very difficult to find office space or to acquire land or property to develop.

8.3.3.4 Cost of Living

The cost of living in NACOG is below the national average, as measured by Economy.com's cost of living index for the Flagstaff metropolitan area. It is nearly 4% below the national average and slightly below the Phoenix and Tucson indexes. This ranks the area 111th in the nation out of 318 metro areas. Although living costs in the metropolitan area rose through most of the 1990s, they remain slightly below the national average.

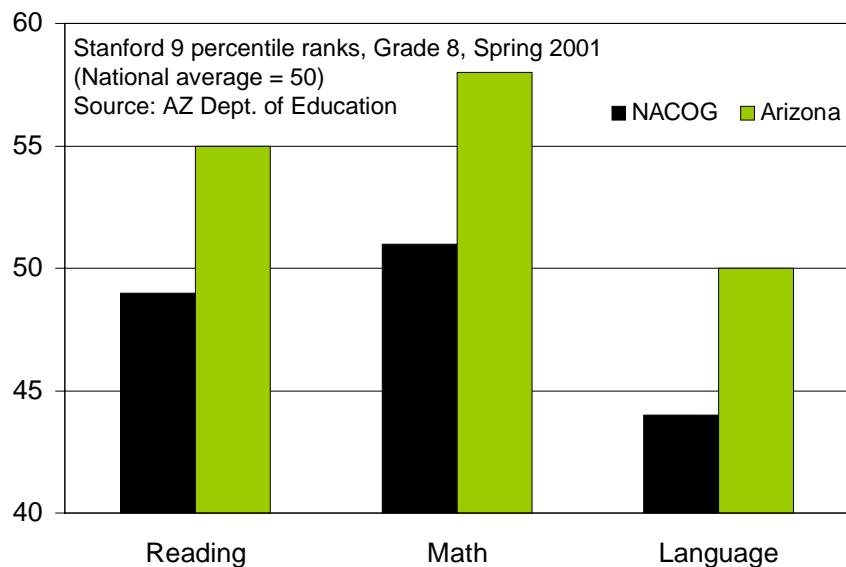
The Flagstaff area is often considered a higher cost area for Arizona due to higher housing costs. Energy, transportation and retail costs in the Flagstaff metro area are the lowest among all metro areas in the state, and are below the national average. High housing costs, however, drive up living costs in the region. Much like the restricted supply of office space in Flagstaff, the large amount of federally owned land around Flagstaff places some limitations on available land for housing. Indeed, the housing, auto, and auto insurance components of Flagstaff's cost of living index are above average. But Flagstaff's lower costs for utilities (due to its temperate climate during much of the year) and lower costs for food and other consumables keeps the overall index slightly below average.

8.3.3.5 Education and Workforce Quality

Most available measures of education quality in NACOG rank the region below the statewide average. Academic proficiency within the region is well below average according to eighth grade proficiency in reading, math, and verbal skills according to Stanford 9 measures (see Chart 74). NACOG's 2001 dropout rate of 10.2% as reported by the Arizona Department of Education is just slightly higher than the 9.8% figure for the state.

As with most indicators in NACOG, education indicators vary greatly across this vast region, with better educational performance in the more urbanized parts of the region, and worse performance in the more rural and less accessible locations in the region. This contrast is most starkly illustrated by educational attainment among the adult populations

Chart 74: Eighth Grade Proficiency, Northern Arizona



of the region. In Coconino County, the 2000 census reports that nearly 30% has earned a bachelor's degree, compared to the 23.5% statewide average. Clearly, the concentration of faculty and graduates associated with NAU influences this figure. Yavapai County's college educated population amounts to over 21% of its adults, nearly equal to the statewide average. The figures, however, drop to just over 12% and 11%, respectively, in Navajo and Apache counties, bringing the region's overall rate slightly below average for the state (see Chart 75). Thus, as with so many economic indicators, the opportunities and challenges represented by educational achievement cannot be easily represented by summary figures for this region.

The mixed picture for workforce quality combined with the extremely high share of employment in government service keeps the average productivity of the workforce below average. Moreover, there has been little improvement in productivity over the past 30 years (see Chart 76). It may be difficult to improve the region's productivity if the industrial structure of the economy remains unchanged in the years to come.

8.3.3.6 Health, Welfare and Crime

Reflecting the region's employment and income trends, NACOG's poverty rate is well above the national and statewide averages (see Chart 77). The contrasts between its component counties are remarkable. Yavapai's poverty rate of 11.9% is among the lowest in the state as of 1999 according to the 2000 census. Navajo and Apache Counties, with rates at or above 30%, are the highest in the state and among the highest nationwide. It is significant to note that Apache's rate fell by nearly 10 percentage points over the course of the decade and Navajo's fell by over 5 percentage points. Yet they still remain very high.

The health status of NACOG residents is nearly on par with residents around the state, although the variation across the counties remains significant (see Chart 78). The mortality rate in Yavapai and Coconino Counties is at or below average, but it is extremely high in Navajo and Apache Counties. The infant mortality rate is slightly above average for the region, but is exceptionally high in Apache County. Unlike the more urbanized regions of the state, however, NACOG does have below-average teen pregnancy rates for Arizona, although it remains higher than the national average.

One encouraging boost to quality of life in NACOG is its low crime rate (see Chart 79). This is quite similar to the less urbanized regions of the state. Crime rates are significantly higher in and around the Phoenix and Tucson metropolitan areas.

Chart 75: Educational Attainment, Northern Arizona

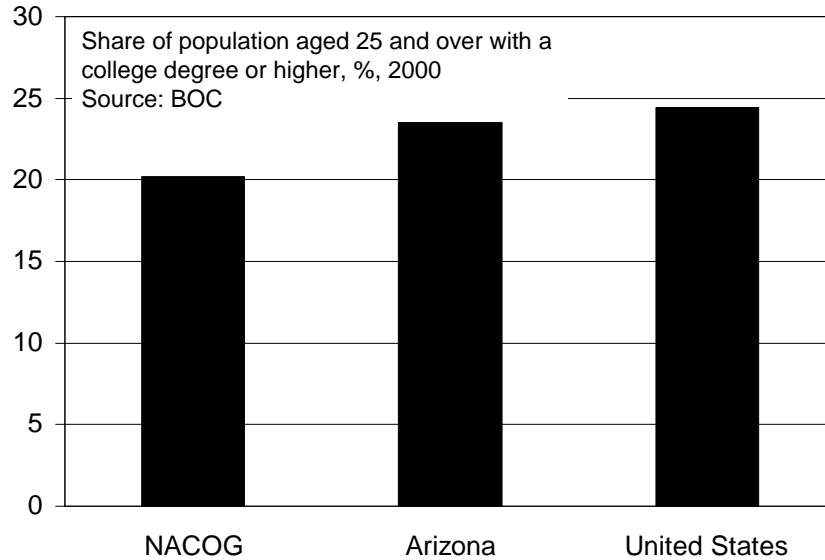


Chart 76: Productivity, Northern Arizona

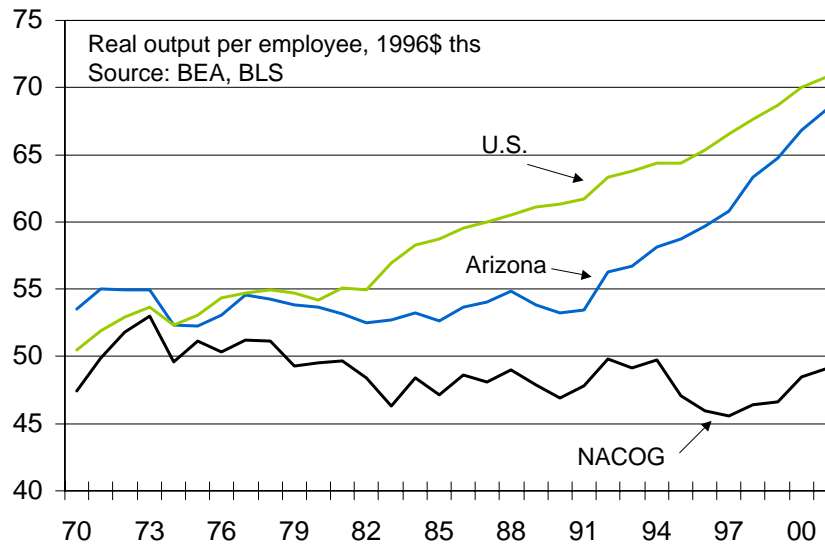


Chart 77: Poverty Rate, Northern Arizona

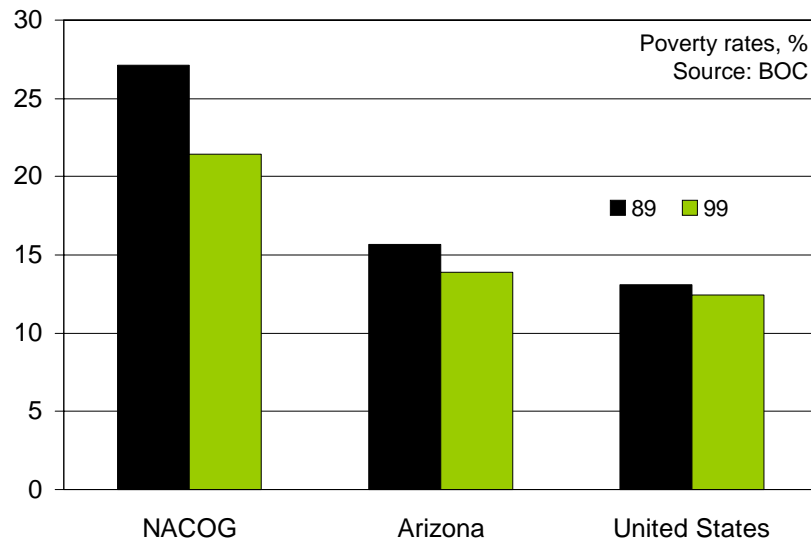


Chart 78: Infant Mortality Rate, Northern Arizona

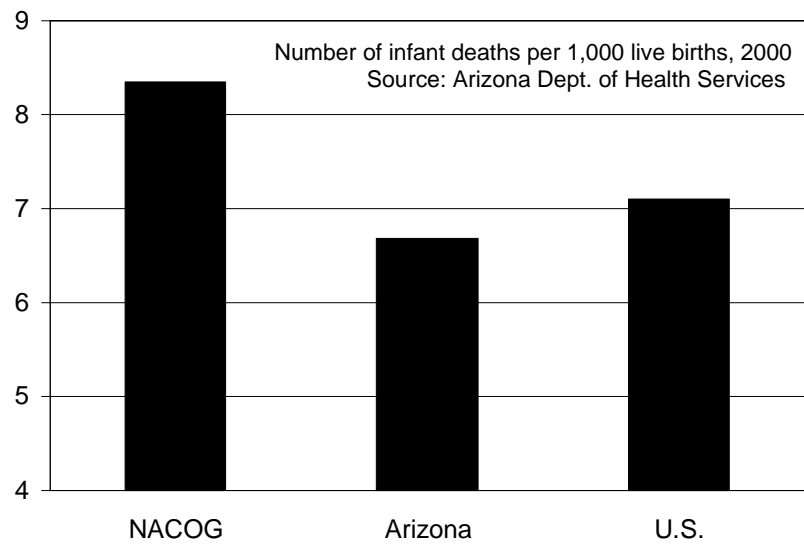
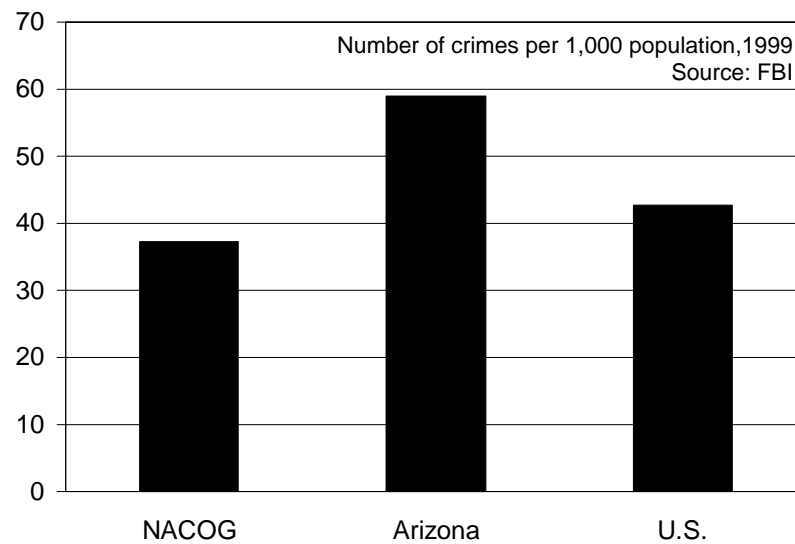


Chart 79: FBI Crime Index, Northern Arizona



8.3.3.7 Infrastructure

The vast and rural nature of NACOG generates a number of challenges for the provision of infrastructure. Water, roads and telecommunications infrastructure can be fragmented at best, and nonexistent at worst.

The difficulty with infrastructure is most apparent with regard to basic telephone services. Forty-six percent of households in Apache County lack telephone service. The figure is 25% in Navajo County and 12% in Coconino County. Some of the limitations of the lack of wired phone service is offset by new wireless services, but this is not available throughout the region as well, let alone broadband service for high-speed telecommunications. This serves as a real barrier for economic development in the region.

Water presents another difficulty longer term. Outside of the Prescott area in Yavapai County, there are no Active Management Areas within the region and water is provided by a number of fragmented surface and groundwater sources. Indeed, the total available water resources within the region are not fully known and require further research. The Verde Valley does appear to have adequate water resources for some time to come, but Prescott will have to import water some time in the future. The region will have to actively improve both water sources and water distribution systems in the years to come.

NACOG does benefit from the presence of I-40 that provides direct east-west access through the state and I-17 that links the region with Phoenix, as well as the Burlington Northern Santa Fe railway system that services the region in an east-west direction. Problems with highway infrastructure are related to quality, and with so many issues, distribution. The surface of I-40 is near the end of its expected 50-year life and needs to be completely rebuilt to handle long-term growth of truck and auto traffic. Elsewhere, the region is served by a series of secondary highways of varying quality. This is particularly problematic in the steep terrain such as on access roads to major population centers within Yavapai County.

8.3.4 Economic Opportunities

NACOG's current economic structure provides few opportunities for the future. With little manufacturing, and a dependence upon government and mining for long-term employment, there is little within the current structure aside from tourism, higher education, and some retiree migration to drive the economy forward.

Yet, among the future opportunities identified for the state, four are particularly suited to the region. These industries are:

- Software and systems design
- Healthcare/Biotechnology
- Forest Products
- Engineering Research and Testing

All of these industries have some natural link with research and teaching at NAU. The university's College of Engineering, and particularly its Center for Data Insight, offer potential for collaboration and development within the industry. The link to engineering research and testing is also clear. Moreover, given adequate broadband access, independent software engineers would be attracted to the scenic locations that NACOG has to offer. Further, the USGS astro-geology and mapping facility located in Flagstaff also offers potential for research and development activity.

Healthcare/Biotechnology similarly is linked to the university through the research collaboration that will take place between the TGRI and NAU faculty. Furthermore, there is a need for further research and support of healthcare in the more remote regions of NACOG.

Forest products generate considerable potential for the region. There is good potential for some changes in forest management practices on federal lands that may allow increased commercial use of the forests through small-diameter logging and the processing of this resource into consumer and industrial products. Given the needs to manage environmental quality as well, there is potential for further improvements in related environmental technology. And there will very likely be a need for more intense research on forest management practices that make use of the commercial potential and environmental technology to reduce the risk of forest fires and simultaneously to improve the productive use of the resource.

While not listed as an emerging opportunity because of its current presence in the region, tourism cannot be forgotten as a tool for future economic development. The diversity of natural and cultural endowments in the region, ranging from the Native American culture and history in the northeast, the Grand Canyon to the north and west, the Verde Valley and scenic Sedona areas, and the mountains surrounding Flagstaff, the opportunities are seemingly endless. One of the features of tourism, particularly in some of the remote regions of the state, is that it offers many opportunities for small businesses to grow. It also affords opportunities for cultural attractions to flourish, which can benefit both visitor and resident alike. Thus, further tourism development throughout this vast and diverse region also provides continued economic opportunities for the region.

There are many constraints facing the economy as well. The low educational attainment in the remote parts of the region is particularly important. The need to improve infrastructure to better link the region with the state and the nation also is important. Funding for research regarding further development of the natural resources of the region would help broaden the economy's base through new manufactured products and services that would greatly enhance economic prospects. And providing greater links between the engineering and technology base that does exist in the region with industries in Arizona's larger metropolitan areas would expand opportunities as well.

8.3.5 Economic Outlook

As mentioned above, NACOG's current economic structure limits the economic potential going forward. While Economy.com's baseline outlook for employment is very strong at over 4% per year, its flagging productivity will keep real per capita income growth at under 0.5% per year. There is potential for improvement, however. A high alternative forecast based on improving the five measures of comparative advantage described in Section 6 bring the projected real per capita income growth to 2.2% per year. Improving education, research opportunities and business costs would afford considerable potential to shift the industrial structure toward more productive enterprises. The high forecast assumptions also generate stronger employment growth at 4.7% per year. The alternative low forecast in which measures of comparative advantage worsen produces a forecast where real per capita income actually declines moderately and employment growth slows to under 4% per year.

8.3.6 Foundational Issues

The constraints to the NACOG economy are related to serious foundational issues evident in the region. Education, healthcare, and financing all pose serious challenges to the region. Low educational attainment is a detriment to Navajo and Apache counties. Limited healthcare in many parts of the region also poses limitations to economic development. And given the fact that tourism, driven in part by many small businesses, will remain an important component of the economy, the availability of small-scale financing and credit and business counseling will be critical to the foundation of the economy longer term. Finally, due to the vast land holdings of the federal government and Native American tribes, economic development in NACOG will likely require a much greater partnership between public and private stakeholders than in most other regions of the state.

8.4 Western Arizona Council of Governments (La Paz, Mohave and Yuma Counties)

8.4.1 Current Economic Trends

The WACOG economy performed rather well during the 2001 recession and the first half of this year. Employment has held steady, as has the area's unemployment rate. Residential construction permits have increased over the past year. The winter tourist season barely suffered from the events of 9/11. The region's winter residents and short-term visitors drive in from the Midwest and the West Coast, thus the fear of flying following 9/11 had little impact on the region.

Further helping stabilize the WACOG economy over the past year is the relative lack of high-tech manufacturing industries. There has been no impact on the regional economy from the downturn in Arizona's and southern California's tech-based manufacturing industries. WACOG depends overwhelmingly on services and agriculture.

WACOG's economy is split largely between Yuma County in the south and Mohave County in the north, which together account for nearly 95% of the region's employment and population. La Paz County has fewer than 20,000 residents according to the 2000 census. Yuma County's population of 160,000 is only slightly larger than Mohave County's 155,000. Yuma County's employment base, however, is larger. Its employment to population ratio of about 40% is well above Mohave County's figure of about 30%, illustrating Mohave's role as both a retirement area and as a place of residence for commuters to Laughlin and the greater Las Vegas area in Nevada.³⁰ Indeed, Mohave County is included for statistical purposes as part of the Las Vegas metropolitan area. Mohave County has benefited in recent months from the relatively rapid recovery of the Las Vegas tourist economy.

8.4.2 Industrial Structure

Leading and lagging basic industries. WACOG's economy is supported broadly by tourism, federal civilian and military employment, retiree-related construction and services, and agriculture. Its largest employers—federal government (the U.S. Marine Corps, Army, Border Patrol, Interior Department), agriculture and tourism/travel industries, represent the stable or deconcentrating base of the economy (see Table 22). Hotels and lodging and federal civilian employment have a stable presence and are expanding along with the rest of the economy. The military payroll is stable in number, but because the larger economy is expanding, its impact is less concentrated than a decade ago.

Agriculture is one of the largest industries in the region. The estimated gross product of agriculture and food processing, which varies from year to year due to changes in production and price, accounted for an average of 10% of the region's entire gross product over the past decade. While farms and crop services are categorized as deconcentrating industries based on their payroll trends, farm labor and management services is a large stable component of the industry. Adding up payrolls for farms, crop services and farm labor and management illustrates a moderately expanding industry that accounts for over 10% of payroll employment. Thus, agriculture as a broadly defined industry must be considered one of the stable components of the economy. Differing patterns of employment among the components of agriculture are indicative of changing management practices within the industry.

³⁰ Both ratios are below the U.S. and Arizona figures of about 47% and 44%, respectively.

Table 22: Characteristics of WACOG Basic Industries

Dynamic Industries

078	Landscape and horticultural services
243	Lumber and wood products (Millwork, plywood and structural materials)
42	Trucking and warehousing
616	Non-depository financial institutions (mortgage banks)
703	Camps and RV parks
841	Museums and art galleries
873	Research and testing services

Growth Industries

15	General building contractors
22	Textile mill products

Stable Industries

076	Farm labor and management services
70	Hotels and lodging
GVF	Federal government

Deconcentrating Industries

72	Crop Services
FR	Farms
ML	Military

Note: WACOG consists of La Paz, Mohave, and Yuma Counties

What is interesting about the WACOG economy is the diverse nature of the industries categorized as dynamic or growing industries. To be sure, none of these industries is large. Few employ more than 1,000, and it should be noted that estimating employment and growth trends in small industries within small economies is always subject to some error.

Some of the industries in these groups are those regularly associated with a rapidly growing economy—landscaping services, lumber and wood products, mortgage banks and general building contractors—and illustrate the importance of migration and construction to the economy. Yet even lumber and wood products produced in the region also are shipped to markets extending into southern California, Nevada, the larger metropolitan areas of Arizona and beyond, making it truly a basic industry.

The largest of the dynamic industries is trucking and warehousing, illustrating the expanding role of this region in linking southern California with Arizona and points beyond the state. Camps and RV parks are indicative of the important role of winter travel and tourism to the region. This is the fastest growing component of the travel and tourism industry, although the very small component of museums and art galleries is also expanding. It should also be noted that the numerous casinos on Indian reservations in the region are a component of the tourism industry, although their presence does not appear in the data, probably because they may still be classified as local government enterprises. The presence of research and testing services and textile mill products further attests to the diversity of small industries in the region.

Thus, while the WACOG economy may be small, it is driven by a variety of industries ranging from manufacturing, transportation, tourism, agriculture, and government. Moreover, because of the geographic size of the region that shares borders with Mexico, California, Nevada and Utah, the characteristics of the industries vary throughout the region.

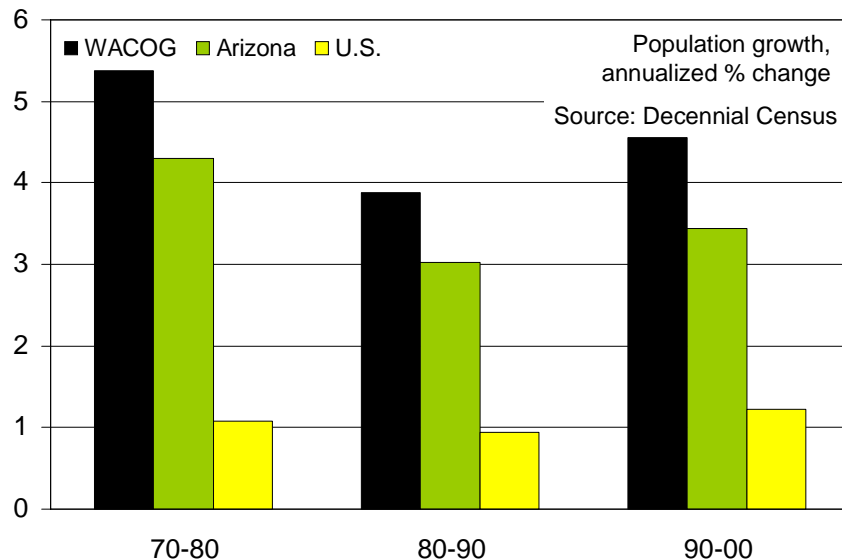
Despite the relative diversity that WACOG enjoys among its basic industries, the WACOG economy as a whole has the lowest industrial diversity of all the COGS in Arizona. The diversity equals 0.01 when the base used is the U.S. economy (see Appendix). When based on the Arizona economy, it is still the lowest, but the value rises to 0.28 versus 1.0 for the Arizona base. The region's industrial diversity is weighed down, however, by the narrow industrial structure in La Paz and Yuma counties. The index for Mohave County is a broader 0.30 when using the U.S. base; 0.37 when using the Arizona economy as the base. Indeed, Mohave County is the larger center of economic activity within WACOG with a broader economic base than elsewhere in this region.

8.4.3 Measures of Comparative Advantage

8.4.3.1 Population

WACOG's population was the fastest growing among Arizona's six regions over the past decade according to the 2000 census. Any way the decade's growth is measured, it is remarkable. Its annualized growth rate of 4.7% over the decade added 120,000 to the region's population (see Chart 80). The 334,800 counted by the 2000 census was an increase of 56%

Chart 80: Population Growth, Western Arizona



over 1990. Mohave and Yuma Counties had the fastest growth, but even the small population of La Paz County grew at a rate slightly faster than the statewide average.

The age distribution illustrates one of the differences between the three counties within the region. La Paz County has the oldest population with 26% of the population over 65, and 40% over age 55. Comparable figures for the state are 13% and 22%, respectively. Moreover, the distribution of the population changed in La Paz over the 1990s with the over-55 population share rising from 31% to 40%. Statewide, its share rose by less than one-half percentage point.

The retirement-age cohorts in Mohave and Yuma counties also are significant, but not nearly so as in La Paz. Mohave's over-55 population share of 34% barely rose over the decade. Yuma's share of 26% is the smallest of the three counties, but it did rise moderately from 22% in 1990.

Conversely, Yuma's under-20 population share of 32% is slightly above the statewide figure of 30% while the youth shares of population in La Paz and Mohave are 23% and

25%, respectively. As with the older population cohorts, the change over the 1990s was most dramatic in La Paz with its youth share falling from 29% over the ten-year period.

Thus, population distribution appears most dynamic in La Paz County with its rising share of older residents. Mohave County certainly attracts retirees, but its communities along the Colorado River such as Lake Havasu City and Bullhead City also attract a broad range of households. La Paz's younger population distribution may be accounted for by the Colorado River Indian reservation, the presence of the military in neighboring Yuma, and by the higher birth rate among the county's 22% share of population that is foreign-born from Latin America.

Overall, the region's population is quite dynamic in its ability to attract retiree and workforce migrants from other states and international migrants largely from Mexico. The WACOG region is the second-most dependent upon migration for its population growth after the CAAG region.

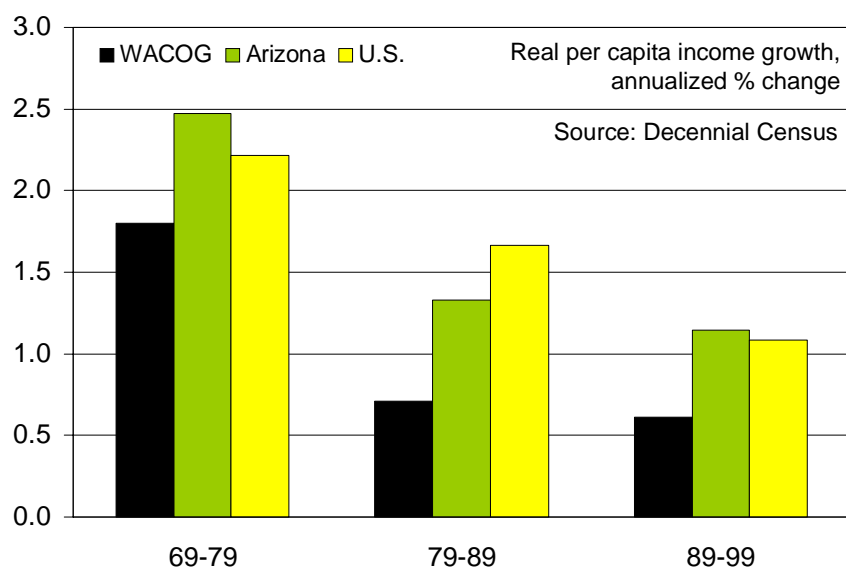
8.4.3.2 Income

WACOG's dynamic nature is dimmed, however, when examining income growth (see Chart 81). Its real per capita income growth over the 1990s was the slowest of any of the six regions in Arizona and is thus losing ground with the rest of the state. Despite the slow growth, the 2000 census estimate of per capita income—\$15,700 in 1999—is about equal to the other less urbanized regions in Arizona. It is about equal to CAAG and NACOG, and slightly above SEAGO.

WACOG's income trends can be accounted for by industrial and population mix. Retiree migrants tend to bring considerable wealth, but their income streams may be moderate as they depend upon pension and investment income. The industrial structure of the economy includes few high-value added industries so that the average wage per worker in the region is about 60% of the statewide average.

Federal government employment does help stabilize income in the region. The military, the Border Patrol, Park Service agencies and others pay higher wages than agriculture, small industry and many aspects of the tourism industry. Moreover, federal employment is more stable over the course of a year with less of a seasonal pattern than much of WACOG's private industry base.

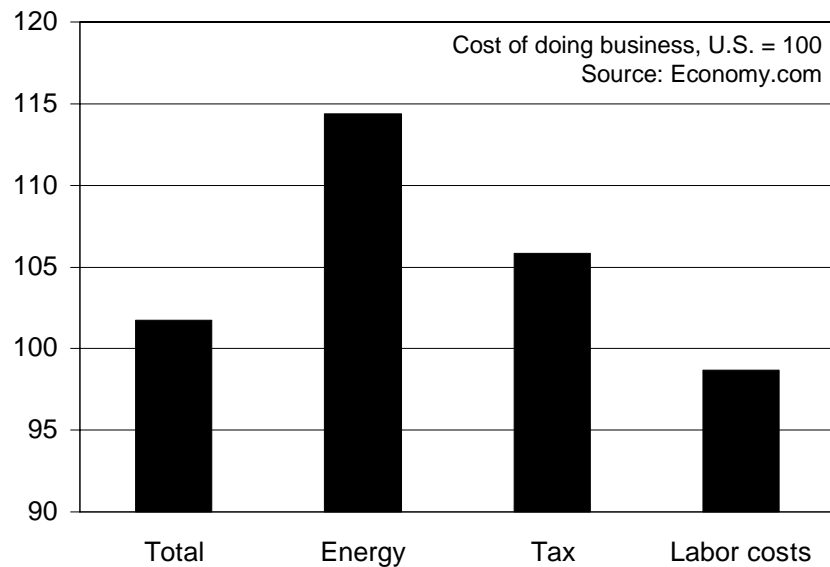
Chart 81: Income Growth, Western Arizona



8.4.3.3 Cost of Doing Business

WACOG's cost of doing business, like the rest of the state, is very near average for the nation (see Chart 82). Energy is the highest component, although it must be pointed out that energy costs are still below rates paid in nearby California. WACOG's tax component also is above average, although it must be remembered that this component of the index is normalized by total personal income. As noted above, income per capita is well below the nationwide average, thus inflating the tax burden index. Unit labor costs are slightly below average. Finally, the cost of office space in the Yuma metro area, a proxy for WACOG, is well below average.

Chart 82: Cost of Doing Business, Western Arizona



Although it is one of the least urbanized regions of Arizona, WACOG competes directly with metro areas outside the state. There are two reasons for this. First is its geographic proximity. It borders California's Riverside-San Bernardino metro area, and WACOG's Mohave County is a part of the Las Vegas metro area. Second, industrial development in southern California is gradually shifting eastward, creating opportunities for WACOG to capture some of this economic activity.

WACOG competes very well with the neighboring Riverside-San Bernardino metro area on all components of the cost index. Riverside's tax burden index equals 108 or 8% above average. WACOG's is 106. If the burden included only income taxes, WACOG would appear even more advantageous. While WACOG's energy index equals 114, Riverside's is much higher at 144. It should be noted that WACOG is less competitive versus Las Vegas for these measures, although office space is less expensive in WACOG than it is in either the Riverside or Las Vegas metro areas.

Thus, WACOG's business cost structure is generally favorable versus competing areas, with one exception. The tax burden for businesses can be high in WACOG versus California areas due to the 25% property tax that is imposed on industrial and commercial property in Arizona. Depending upon the industry, this may be enough to offset lower taxes for income, workers' compensation and personal income.

8.4.3.4 Cost of Living

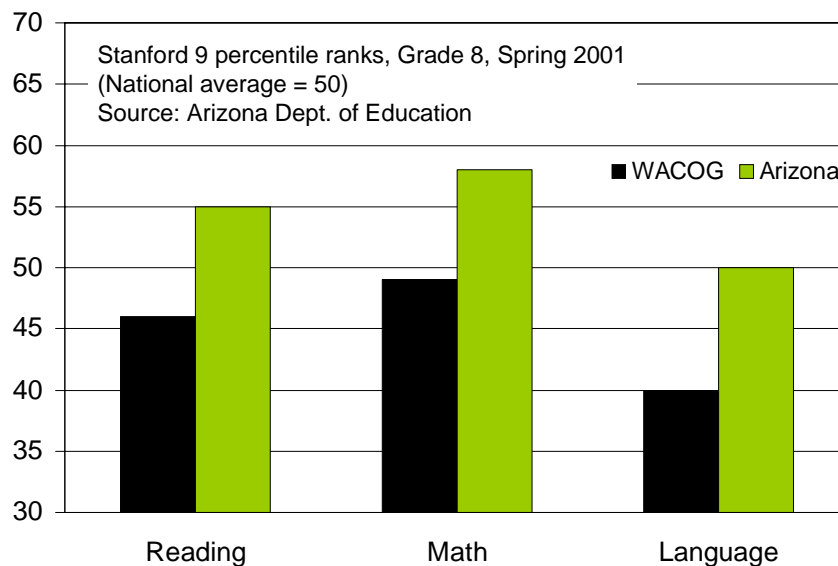
The cost of living in WACOG is very favorable. Economy.com estimates the cost of living only for metropolitan areas. Thus, the only available cost of living index in WACOG is for Yuma County, where the index equals 93 or 7% below the national average. This compares very favorably to indexes of 100 for Riverside-San Bernardino and 102 for Las Vegas. High energy costs counteract Yuma's otherwise low cost of living, but inexpensive housing and low retail costs offset higher utility prices in the region.

The cost of housing in the region is favorable versus southern California and Las Vegas. Economy.com estimates the median sales price of single-family homes in 2001 ranged from \$101,000 in Yuma County to \$109,000 in Mohave County. These prices are well below the \$156,000 median price in the Riverside metropolitan area and the \$149,000 median for Las Vegas. The difference in affordability is not so great because of the rather low level of income earned in WACOG, but for migrants comparing house prices in the three areas, and particularly for those with equity from the sale of a house in California, WACOG's housing market compares very well.

8.4.3.5 Education and Workforce Quality

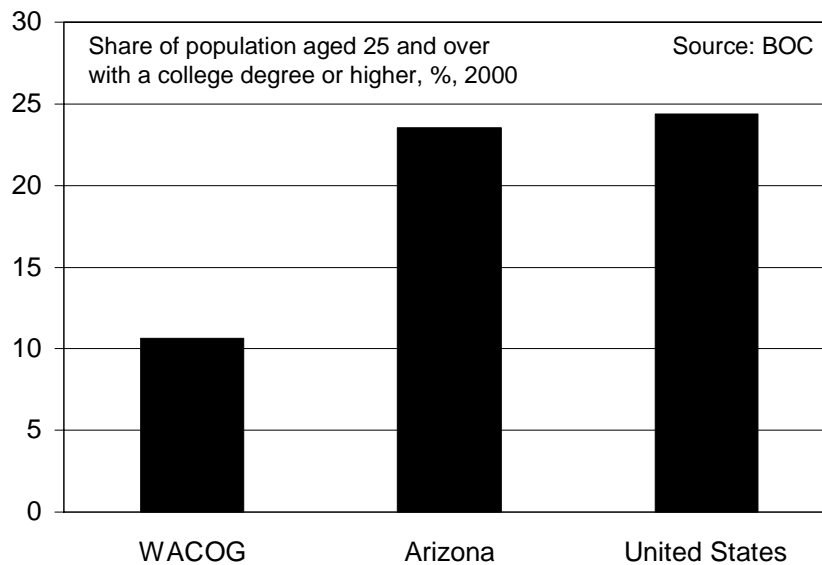
Indicators of education and workforce quality show some disadvantages for the region. For example, education spending per student in WACOG is the lowest in Arizona. The dropout rate among WACOG students was 10.7% in 2001, which was above the state average of 9.8% and ranked third highest among the six regions. Similarly, academic proficiency in WACOG is considerably below the state average, and is better only than the CAAG region (see Chart 83). Thus, the workforce emerging from the local school systems may not be competitive.

Chart 83: Eighth Grade Proficiency, Western Arizona



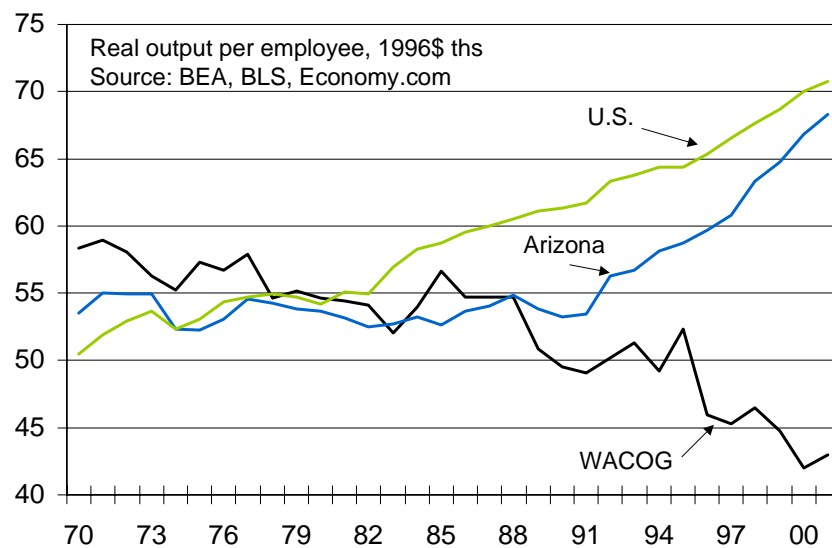
Moreover, migration does not appear to improve the workforce. The educational attainment of the total adult population over 25 years of age also trails most areas (see Chart 84). The share of the adult population with a bachelor's degree ranges from 8.7% in La Paz County and 9.9% in Mohave County to 11.8% in Yuma County. La Paz and Mohave Counties rank at the bottom of all of Arizona's 15 counties and, outside of WACOG, only Yuma County ranks above only Apache County. Similar figures for California's Riverside and San Bernardino Counties and Nevada's Clark County are within the 16% to 17% range.

Chart 84: Educational Attainment, Western Arizona



Workforce quality and the area's industrial structure help explain WACOG's low productivity (see Chart 85). Economy.com estimates that productivity, as measured by real gross output per payroll worker, has declined steadily over the past 20 years, and that the pace of decline worsened during the 1990s at the same time that it improved nationwide. Moreover, during the 1970s and 1980s, productivity in the region was at or above the rates seen nationwide, and then fell considerably during the 1990s. This is indicative of the weak income trends and represents a serious challenge for the economy going forward.

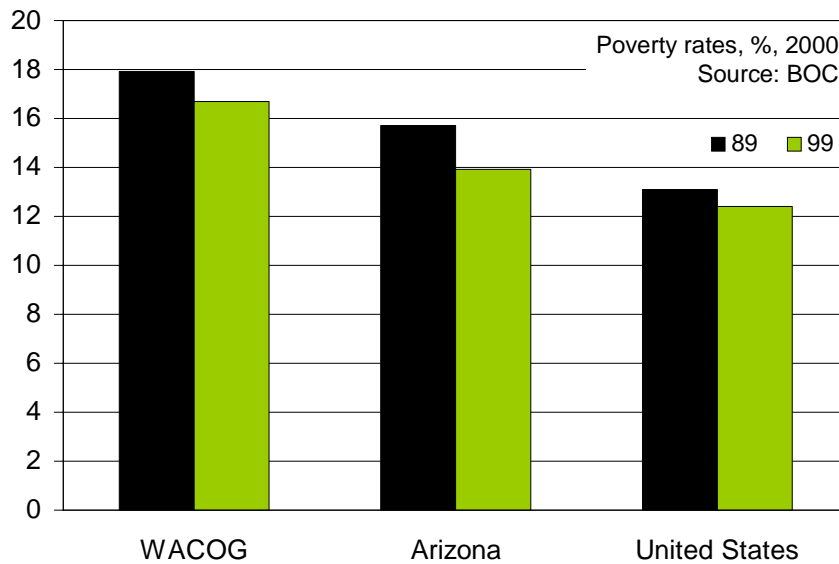
Chart 85: Productivity, Western Arizona



8.4.3.6 Health, Welfare and Crime

The poverty rate in WACOG averaged 16.7% in 1999 according to the 2000 census. This ranks the region third behind MAG and PAG and not far above the 13.9% rate for the state. The rate is lowest in Mohave County, at just 13.9%, where employment in Kingman, Bullhead City and the Las Vegas metro area is less seasonal and more diverse across industries, and where retirees generally have a steady income. Income in Yuma is particularly dependent upon seasonal farm work with low wages. The poverty rates in both Yuma and La Paz Counties were just under 20% (see Chart 86).

Chart 86: Poverty Rate, Western Arizona



WACOG's poverty rate did fall between 1989 and 1999, with nearly all of the improvement occurring in La Paz County. The rate fell by nearly nine percentage points from 19.6% from 28.2%. The only county to see a larger fall over the decade was Apache County.

Measures of health conditions in WACOG are on par with residents around the state, although there are some regional variances within the COG. The mortality rate in Yuma and La Paz Counties are at or below average, but are high in Mohave County. Similarly, the infant mortality rate is about average in Yuma County, but is very high in Mohave and La Paz Counties. On average, WACOG's infant mortality rate is just below the U.S., but higher than the average for Arizona (see Chart 87). WACOG does have a below-average teen pregnancy rate for Arizona. This is consistent with statewide trends, where they are the highest in the more urbanized areas and lower in the more rural regions.

One encouraging indicator of quality of life in WACOG is its low crime rate, which is well below the national average (see Chart 88). The FBI crime index indicates that per capita crime in WACOG is the lowest of the state's six regions. In particular, WACOG's average homicide mortality rate is very low.

Measures of health and welfare, therefore, appear to add to the region's attractiveness to migrants, generating strong population growth. They serve to offset disadvantages that arise from measures of education and workforce quality.

Chart 87: Infant Mortality Rate, Western Arizona

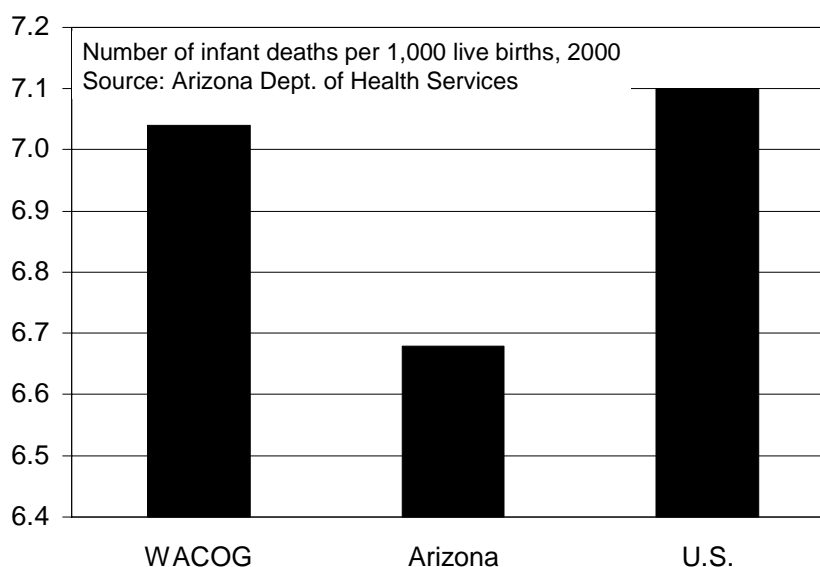
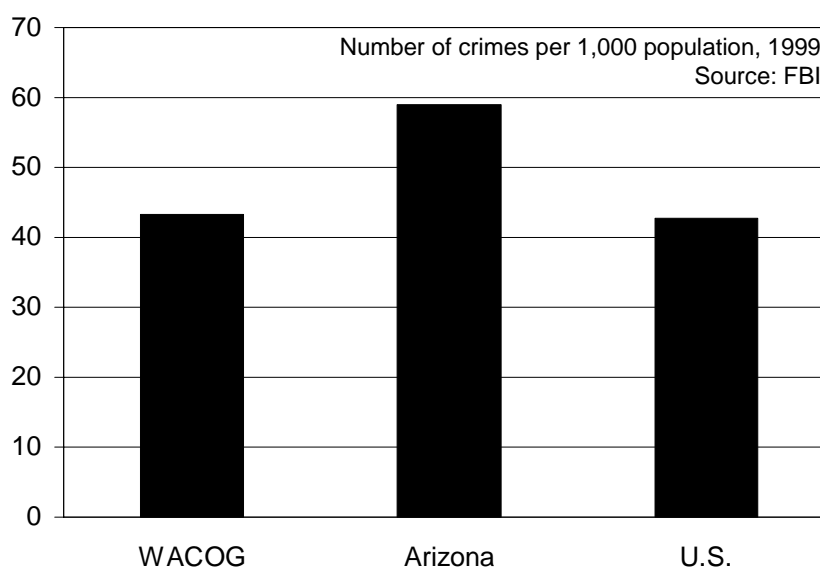


Chart 88: FBI Crime Index, Western Arizona



8.4.3.7 Infrastructure

In many ways, infrastructure poses less risk to WACOG than other regions of the state, although the rapid pace of the region's population growth will put constant pressure on infrastructure systems.

Availability of water is less of a problem than elsewhere since nearly the entire population of the region lives near the Colorado River. The region will certainly have to work to expand distribution systems in the future, but the source of water is close by. Similarly, the distribution of water between agriculture and urban uses will change as the economy expands, putting some pressure on agriculture to use water as efficiently as possible. WACOG has the largest number of acres under irrigation of any region in the state, primarily in La Paz and Yuma Counties.

Highway infrastructure also is fairly well developed, at least in the east-west direction with I-40, I-10 and I-8 linking the region between California and Flagstaff, Phoenix and Tucson. Road transportation is more problematic in the north-south direction. Should the vision of the CANAMEX corridor be fully realized, this problem will be taken care of for Mohave County as Highway 93 would be improved, and construction has already commenced for a bypass around Hoover Dam. Thus, Kingman and much of the county will be well linked to Phoenix and to Nevada and points north and has very good potential to be better integrated into the statewide economy and even more broadly with the rest of the Mountain States region. Highway 95, the other north-south axis is more problematic as it too would require improvement longer term to create a divided highway. Furthermore, access between Yuma and the border crossing at San Luis Rio Colorado will need improvement as cross-border trade increases.

The region is also served by rail access. Burlington Northern Santa Fe's main rail line passes through Mohave County.

Telecommunications infrastructure serves part of the region well. Both Kingman and Yuma have access to fiber-optic long-haul cable via at least three carriers. The more isolated regions, however, still have limited access not only to broadband service but to basic telephone service as well.

8.4.4 Economic Opportunities

WACOG's current economic structure does generate some long-term potential. While its dynamic industries of the past decade remain for the most part quite small, they do mesh with some of the economic opportunities identified for the state. Moreover, even its stable industries offer some potential for further development in the coming years. The specific economic opportunities identified for WACOG include:

- Industrial machinery
- Transportation/Logistics
- Agriculture/Food Processing/Agricultural Technology
- Defense-related industries

Industrial machinery is included on this list because it is underrepresented in the economy, yet there is very good potential for the industry to continue to migrate eastward from the larger California metropolitan areas. The potential for WACOG goes beyond industrial machinery, however, and is illustrative of the potential for further attraction of a broad range of industrial manufacturers in the region. Already, lumber and wood products appear as a dynamic industry in the region and textile mill products appears as a stable industry. Kingman's Airport Industrial Park is home to American Woodmark, maker of kitchen cabinets and Yuma County is home to Tuftex, a division of Queen Carpet. These are examples of how the region serves as an emerging manufacturing and distribution center for the Southwest. Other industrial manufacturers already in WACOG include Goodyear, North Star Steel, Praxair, and Morgan Corporation for example. The region's ability to serve markets in southern California, Arizona, and the rest of the Mountain States region, and its favorable business and living costs, make the region very favorable for higher value-added industrial machinery and equipment and other industrial products.

Similarly, transportation and logistics provide further economic opportunity. The California economy is spreading closer to Arizona. Highway access to the north and south should improve by the end of this decade. Furthermore, there is the beginning of the region's own industrial economy emerging today. Rail lines pass through the region and IWX Motor Freight has a presence in Mohave County. Thus, the region's strategic location

within the Southwest, its existing and planned transportation infrastructure and its own budding industries provide good potential for the industry.

WACOG's existing agricultural economy and natural resources generate further potential for economic development. The potential has several components. The industry will be challenged in the future to use irrigation water as efficiently as possible as other competing uses expand in the state. Thus, there is a need to continue to research and develop new technology and management techniques that would benefit the local industry. Furthermore, the technology itself also could be exportable to other arid agricultural regions. The second challenge is to continue to shift toward high-value specialty crops that can command high prices and expand national and export markets. The third is to expand the processing of raw agricultural products in order to add further value. All three of these components promote a more steady production cycle year round, generate higher value products creating potential for higher wages, and create a more technology-intensive industry that would have greater economic multiplier impacts in the region and greater export potential.

Finally, defense-related industries may have some potential given the presence of U.S. Marine Corps Air Station and the U.S. Army Proving Ground, both located in Yuma County. Rising defense expenditures related to research and development and to procurement that is projected through at least 2007 provide potential for greater links between the local economy and defense activities.

In addition to these emerging industries, tourism will continue to play a major role in the economy. The tourism industry itself is rather diverse and includes serving visitors at Lake Mead and en route to the Grand Canyon, to catering to the winter influx of snowbirds from the Midwest or shorter-term visitors from California, or expanding casino and other services on the region's Indian reservations. There is good potential for further development of small businesses relating to tourism in the region.

To be sure, there are constraints to development within the region. First, while the Colorado River Valley is famed for its beauty, the perception of quality of life is dimmed by the high summer temperatures in much of the region. Second, as mentioned previously, the high personal property tax rate on commercial and industrial equipment acts as a deterrent to industrial development by narrowing the tax advantage of the region versus California. Third, the competitiveness of the labor force is reduced by the low educational attainment of the population.

8.4.5 Economic Outlook

WACOG's location, its cost of doing business and cost of living, its good access to markets in many directions, its natural endowments of land and water, and the scenic beauty of the Colorado River all provide potential for future growth of the region. Its low productivity, however, will continue to constrain income growth in the future. Economy.com's baseline forecast for the region projects real per capita income growth of 0.7% annually over the coming ten years. This is not to say that the economy will not grow, however. The baseline forecast for employment growth is 5.4% annually, about equal to its annual average rate of growth over the past 30 years.

As already mentioned, a primary competitive disadvantage to the outlook is the quality of the workforce. Economy.com estimates that if educational attainment is increased and the other four measures of comparative advantage described in Section 6 are also further improved, an alternative high forecast of real per capita income of up to 2.5% annually is a possibility, and employment growth could rise to at least 6.0%. Conversely, a further reduction in the measures of comparative advantage could reduce real per capita income growth to an annual decline of 0.4% per year and employment growth to a rate of 5.0%, below its long-term historical trend.

8.4.6 Foundational Issues

The primary foundational issue for WACOG is education and workforce quality. The region should continually strive to improve the quality of the workforce from K-12 through community college and beyond. The community college system is particularly important in a region that has potential for further industrial development, but with a workforce that may lack necessary skills. Community colleges in many regions of the country have been effectively integrated into an industrial development plan to provide targeted training programs for expanding and relocating industries.

Another foundational issue is simply access. While highway access is good to the east and west, distances are great and links to the north and south are constrained by bottlenecks at the Mexican border, at Hoover Dam and on the state highways linking towns within the region. Every effort should be made to integrate the WACOG economy into the broader Southwest economy in all directions.

8.5 Central Arizona Association of Governments (Gila and Pinal Counties)

8.5.1 Current Economic Trends

The CAAG region's economy has continued to post positive job growth on a year-to-year basis according to Arizona's Department of Employment Security through mid-2002. Current growth, however, is limited to Pinal County, which is the larger of the two counties. While its job growth is up by over 4% over the year, Gila County's is down by over 4%. With Pinal County accounting for approximately 75% of the region's employment, its strength pulls regional employment growth to 2% over the year, the strongest growth rate of any of the state's six regions. Government and service payrolls drive current growth. The CAAG economy, particularly in Pinal County, is supported by spillover growth from the neighboring MAG and PAG regions, which also support construction, trade and service industries in the region. Similarly, these industries also are supported by retiree migration into the region.

8.5.2 Industrial Structure

Leading and lagging basic industries. CAAG'S economy is dominated by state and federal employment, resource-based industries such as agriculture and mining, tourism, and a variety of smaller industries (see Table 23). The largest single factor is state government, due to Pinal County's state prison. Indeed, state government is categorized as a growth industry due to the expansion of the prison over the past decade. With about 5,000 employees, state government is the largest of the basic employers in CAAG. The other growth industry is heavy construction, indicative of highway and infrastructure construction in the region. Construction may not normally be considered a basic or driving industry, but it does represent state tax revenue flowing through procurements into the region.

The more rapidly growing dynamic industries are each smaller with between approximately 1,000 and 3,000 workers. The amusement and recreation services industry is one of the largest, illustrative of the tourism industry concentrated in the Tonto National Forest and at the region's several casinos. Another is personnel supply services, providing workers for industries distributed across agriculture, manufacturing and services. Plastics, research and testing, and management and public relations

illustrate the variety of small but expanding industries as the Phoenix metropolitan area expands into Pinal County.

Federal government and agriculture are the region's two basic industries categorized as stable. The two counties within this region differ in character. Gila County depends more on federal employment, while agriculture accounts for a larger than average share of Pinal County's economy.

Deconcentrating industries include copper mining and food processing. Copper mining and processing takes place at Asarco's Ray mine and Hayden concentrator and smelter. A diminishing resource, the mine is expected to cease production in about 2040. The Phelps Dodge copper mine will cease production in about 2017. The deconcentration of the food products industry rather illustrates the changing nature of the industry as it shifts from dairy processing to processed foods, much of which is classified simply as miscellaneous food products.

To summarize, CAAG still has a large reliance upon government and resource-based industries. But the region also is diversifying through a number of small growing industries. Much of these are in Pinal County and illustrate the expansion of metropolitan development into the county.

Even with CAAG's rapidly growing and diversifying industrial base, its industrial structure is narrowly defined and differs greatly from the U.S. base with a diversity index of just 0.07 (see Appendix). When measured using the Arizona economy as its base, the index rises to 0.35. In either case, it ranks fourth among the six regions of the state. Both Pinal and Gila counties have low industrial diversity when compared to the U.S. When using the Arizona economy as the base, however, the Pinal County economy is structured more similarly to the state than is Pinal County.

8.5.3 Measures of Comparative Advantage

8.5.3.1 Population

The CAAG region's population growth ranked second fastest among Arizona's six regions over the 1990s according to the 2000 census (see Chart 89). Over the decade, population grew by nearly 48%, which is equal to an annualized rate of 4.0%. This compares to 3.4% for Arizona and 1.2% for the U.S. The only region to exceed CAAG's rate of growth was WACOG. It also marks a change from the 1970s and 1980s when CAAG's population grew by a rate about one-third less than the statewide average.

Pinal County is the fastest growing component of the region with annual growth of 4.4% over the 1990s. Gila County grew by a 2.5% annualized rate. Pinal County's 2000 population of 180,000 accounted for 78% of the region's total. Gila County's population in 2000 was 51,000.

Migration currently has a greater influence on CAAG's population growth than any other region in the state. While the Census Bureau has not yet released revised migration estimates for the 1990s, its estimate of 2001 migration indicates that migration accounted for 84% of population growth between mid-2000 and mid-2001.³¹ Approximately 93% of net migration into CAAG in 2001 was domestic migration. International migration accounted for just 7%.

Moreover, the 2000 census shows that 17% of the CAAG region's population is over 65, ranking second highest behind WACOG's 19% share. CAAG's population over 55 years of age amounts to 28% of total population, just behind WACOG's 30% share.

³¹ While revised migration estimates for the 1990s are not yet available, the 2001 estimates of net migration break with the trend of their preliminary estimates from the 1990s. Thus, it appears that the Census Bureau is taking into account information gained from the 2000 census, even though 2000 census data for population components of change have not yet been released.

Table 23: Characteristics of CAAG Basic Industries

Dynamic Industries

308	Plastics products
736	Personnel supply services
79	Amusement and recreation services
873	Research and testing services
874	Management and public relations

Growth Industries

16	Heavy construction
GVS	State Government

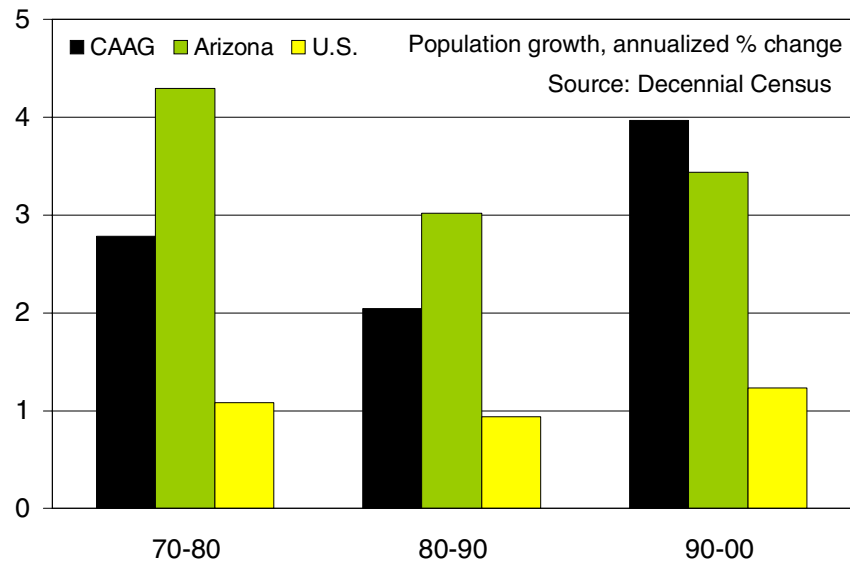
Stable Industries

FR	Farms
GVF	Federal Government

Deconcentrating Industries

102	Copper mining
20	Food products

Note: CAAG consists of Gila and Pinal counties

Chart 89: Population Growth, Central Arizona

Thus, retiree migration is an important factor that drives the region's growth today. It is a greater factor in Gila County's demographic trends than in Pinal County. But even Pinal County's share of population over 55 rose during the 1990s and is above the statewide average, whereas the statewide share remained constant during the decade.

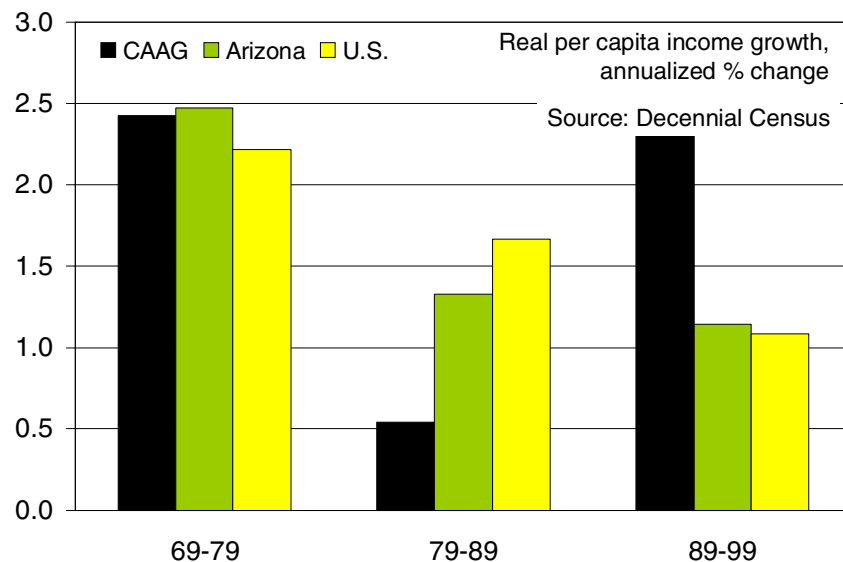
8.5.3.2 Income

Per capita income in CAAG of just over \$16,000 in 1999 is well below the statewide average of \$20,200. But CAAG caught up somewhat during the 1990s according to the 2000 census, with real annualized growth of 2.5% in Pinal County and 1.7% in Gila County. Both exceeded the statewide rate of 1.1% per year (see Chart 90).

Gila County's 1999 per capita income of \$16,300 is only slightly higher than the \$16,000 reported for Pinal County. Both are near average when compared to other regions outside of Maricopa and Pima Counties.

Expanding state government employment supports income growth. Also supporting income growth is the diversifying nature of the economy as households and industries expand out of Maricopa County to places such as Casa Grande and other increasingly urbanized areas.

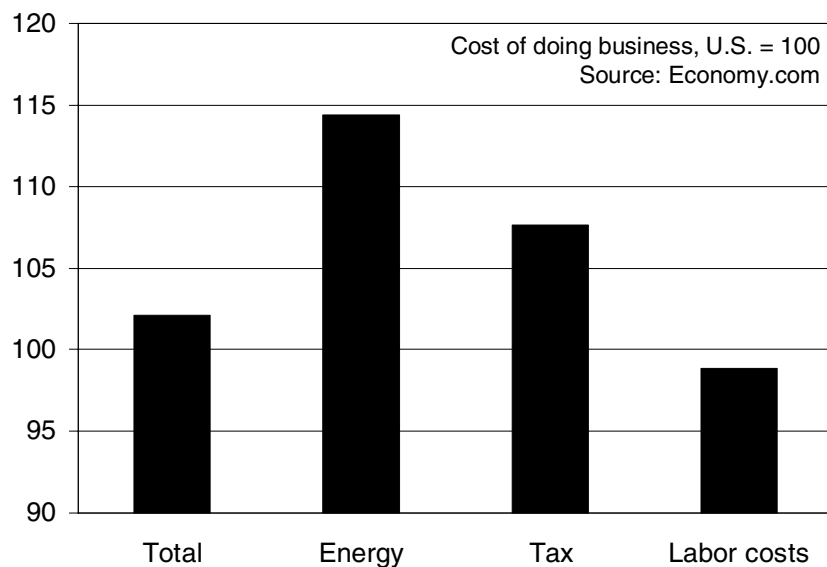
Chart 90: Income Growth, Central Arizona



8.5.3.3 Cost of Doing Business

CAAG's cost of doing business is just above the statewide average with a value of 102 (see Chart 91). In other words, it is 2% above the national average. Thus, business costs, on average, are neither an obvious advantage nor a disadvantage to the economy. As with the other less urbanized areas, the tax burden, as defined as total personal and business tax receipts divided by total personal income, is higher than the statewide tax index due to the region's below-average income. CAAG's energy index is the highest component of the cost index, nearly 15% higher than average due to high industrial power costs. The region's overall cost index, however, is held down by low unit labor costs. The labor component, which accounts for 75% of the overall index, brings it back nearly to the U.S. average. While CAAG's business costs are near the U.S. average, they remain low relative to California, where all components of the cost index are very high.

Chart 91: Cost of Doing Business, Central Arizona



8.5.3.4 Cost of Living

The cost of living in CAAG is fairly low, which makes the region particularly advantageous in attracting migrants from around the state and elsewhere. As a reflection of these lower living costs, housing affordability in CAAG is among the highest in the state, and well above the national average. Economy.com's housing affordability index indicates that a median income household in CAAG can afford a house that is priced 31% above the area's median sales price. This is particularly good for the region given its relatively low household income. Housing in CAAG is the third most affordable in the state.

8.5.3.5 Education and Workforce Quality

CAAG's indicators of education and workforce quality are less than robust. The high school dropout rate, for example, is the highest of any of the six regions at 11.6% according to the Arizona Department of Education. Also, per pupil school district expenditures of \$5,075 in 2000-2001 rank CAAG fifth out of the six regions. The region's eighth graders rank below the 50th percentile in reading and math and below the 40th percentile for language according to Stanford 9 achievement tests (see Chart 92). CAAG's eighth grade proficiency scores ranked at the bottom of the six regions.

Moreover, in-migration only moderately supports the region's measures of educational attainment. The share of adults with a college degree, for example, is just 11.9% in Pinal County and 13.9% in Gila County (see Chart 93). These are below the Arizona average of 23.5%, although they do rank near the middle of the pack among the 15 counties. Gila County ranks 7th and Pinal County ranks 10th.

CAAG's productivity was near average at the outset of the 1990s, but it did not keep up through the course of the decade (see Chart 94). The volatility of the region's productivity, however, is linked closely to the price of copper. When nonferrous metal commodity prices were low between the mid-1970s to the mid-1980s, overall productivity also was low. Productivity rose with commodity prices through the late 1990s, only to fall concurrent with prices since 1997. Mining accounts for between 10% and 20% of total gross regional product in CAAG depending upon copper prices, which makes the price quite influential in determining the region's overall output and productivity. CAAG's strong per capita income growth over the decade is illustrative of

Chart 92: Eighth Grade Proficiency, Central Arizona

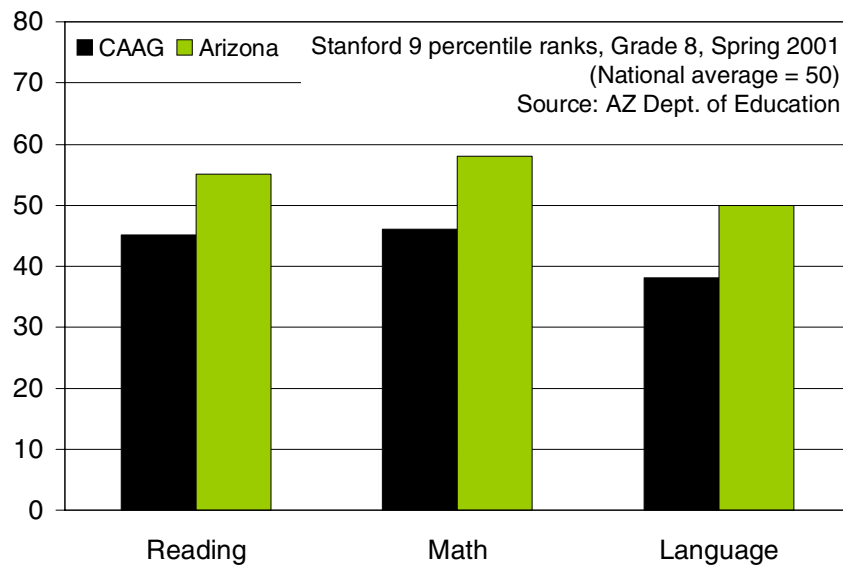


Chart 93: Educational Attainment, Central Arizona

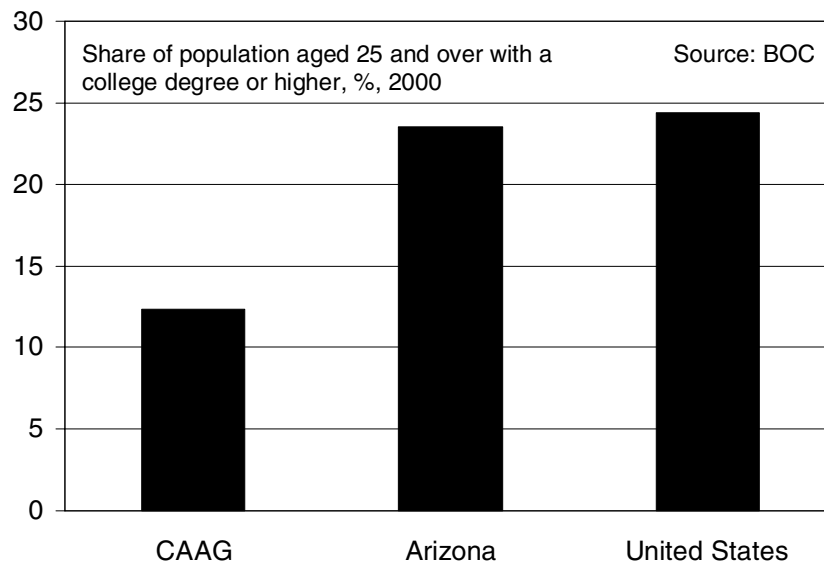
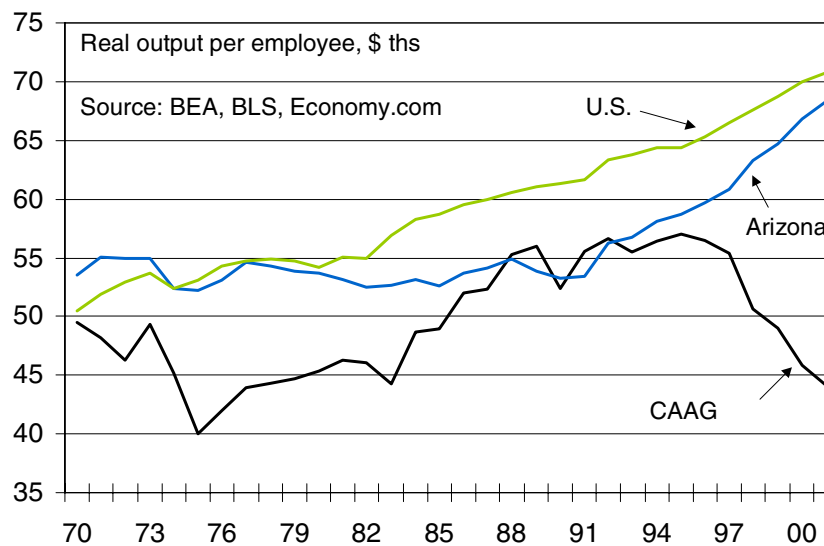


Chart 94: Productivity, Central Arizona



the fact that industrial diversification combined with in-migration will support the economy longer term and that mining will continue to have a gradual but progressively smaller role in the economy as the mineral resource is depleted.

8.5.3.6 Health, Welfare and Crime

While migrants are attracted to the beauty and climate of CAAG's higher elevation lakes and forests, some measures of quality of life are less than robust. The region's poverty rate, for example, is third highest among the six regions at 17% according to the 2000 census (see Chart 95). Gila County's rate of 17.4% was largely unchanged from the 1990 census, although the poverty rate for Pinal County of 16.9% was down by nearly seven percentage points from ten years earlier.

Total and infant mortality rates are high in the region, marking some healthcare deficiencies (see Chart 96). The infant mortality rate is particularly high in Gila County, bringing the region's rate to over 9 per 1,000 live births. Additionally, CAAG has some of the highest teen pregnancy rates in the state and the nation, a figure that is often associated with overall social welfare conditions.

One very positive factor for quality of life in CAAG, however, is its low crime rate (see Chart 97). CAAG's rate is just below the national average, but well below nearby Maricopa County. A low crime rate is quite important in order to maintain an attractive environment for in-migrants to the area.

Thus, measures of health, welfare and quality of life are somewhat mixed for CAAG. Poverty is high but has improved over the past decade. Broad measures of public health are below average for the state. But crime rates are also low. None of these measures is extreme, but indicates potential improvements that are possible in the years ahead.

8.5.3.7 Infrastructure

There is considerable divergence of infrastructure conditions between Pinal and Gila Counties due to their topography and locations. Pinal County, located between Phoenix and Tucson, has considerable infrastructure resources that already pass through it. The Central Arizona Project passes through the county, providing an adequate water resource, although distribution facilities will be necessary to complement future economic growth. Similarly, highway access is good through Pinal County either via I-10 connecting the county with Phoenix and Tucson, or I-8 which links Casa Grande with Yuma and the Imperial Valley of California. Rail access is also good through the county. The challenge for Pinal County will be to accommodate the need for increased capacity on the interstate highways for long-distance travel while managing local traffic needs.

Gila County, on the other hand, is one of the few in Arizona with no direct interstate highway access. This is a limiting factor for commercial links with the rest of the state, although it also likely adds to the charm of the area for migrants seeking a rural environment. Primary access is via state highway 87 to Payson. The southern part of the county is accessible via other secondary highways. Gila County does not have access to CAP water. It avails of surface and ground water in the region.

Telecommunications infrastructure is adequate for the two counties, but there is room for improvement. The Census Bureau reports that 6.2% of Gila County households and 5.5% of Pinal County households still do not have telephone access. Future broadband access will be easier in Pinal County, again due to its location between Phoenix and Tucson, its flat topography, and its potential for much more dense development. The topography and scattered development patterns in Gila County will create more difficulty for improving Gila County's telecommunications infrastructure.

Chart 95: Poverty Rate, Central Arizona

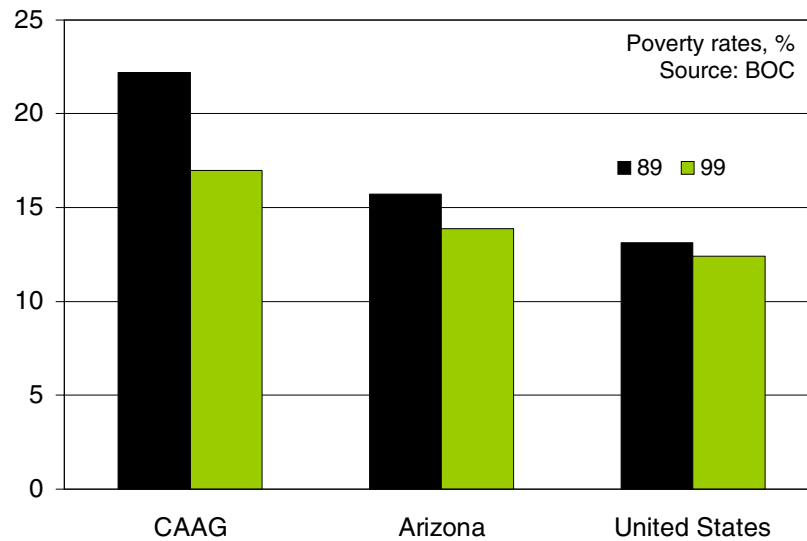


Chart 96: Infant Mortality Rate, Central Arizona

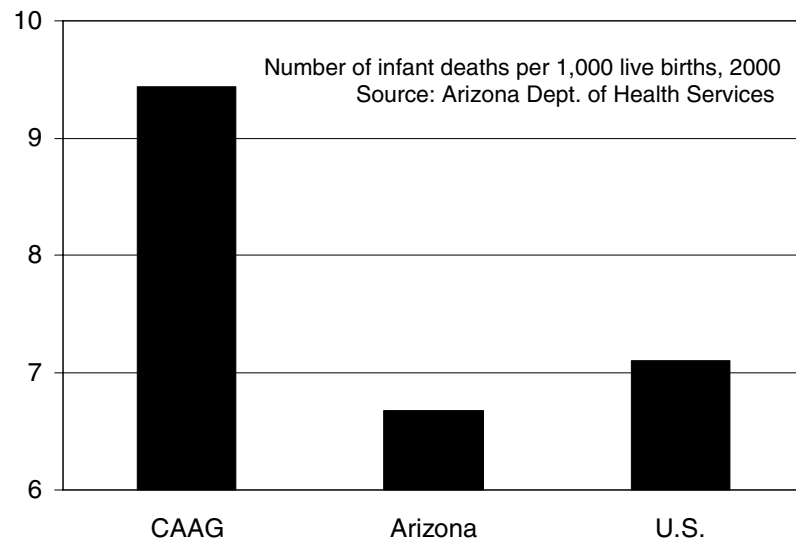
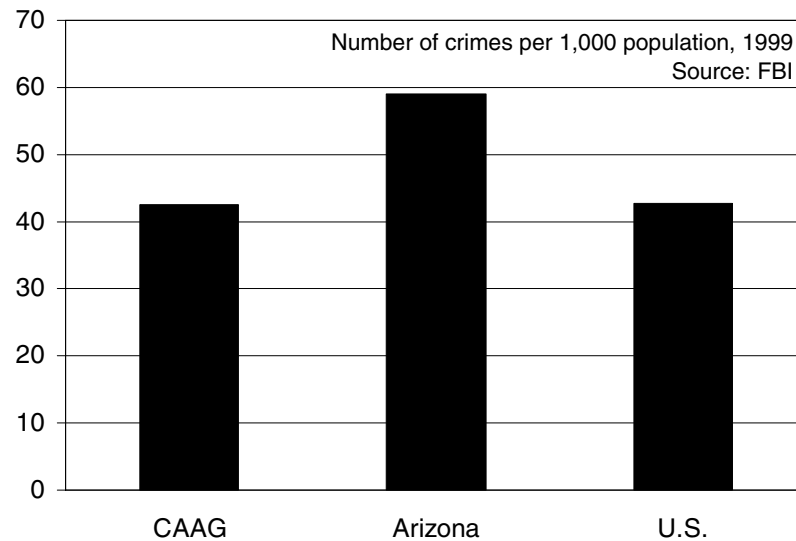


Chart 97: FBI Crime Index, Central Arizona



8.5.4 Economic Opportunities

CAAG's location provides considerable potential avenues of economic development. Its current industrial structure, however, is quite limiting. The region's location, particularly Pinal County, will simply grow as the Phoenix urban area expands southward. The area's dynamic industries of the past decade offer some potential, including manufacturing and tourism. Here again, manufacturing is more likely in Pinal County; further tourism potential is in Gila County. The rest of the current economic structure, however, does not offer a lot of dynamism for the economy. Future opportunities for the region, however, may include:

- Industrial Machinery
- Transportation and Logistics
- Agriculture/Food Processing/Agricultural Technology

Industrial machinery would diversify CAAG's manufacturing economy, whose most dynamic component in past years has been the plastics industry. CAAG's central location, particularly near Casa Grande, provides good potential for this and other manufacturing industries wishing to serve the greater Southwest. The transportation links are good. The cost of doing business is affordable. The location between Phoenix and Tucson adds convenience.

For similar reasons, transportation and logistics offer very good potential. With an ability to serve the two large metro areas and good access to Mexico, southern California, and the rest of the Southwest, Pinal County is a logical location for the industry.

Agriculture already is an important industry in Pinal County. There would be additional potential for improved productivity, expanded processing operations and more efficient use of irrigation technology to make more productive use of the land as urbanization begins to creep into the county.

Opportunities for Gila County will lie with further development of its tourism and resource-based industries. Tourism related to the mountains and lakes as well as within the San Carlos and Fort Apache Indian Reservations (both partially within the CAAG region) provides some upside potential. And while not listed specifically for this region, the forest products industry provides some potential for parts of Gila County. Certainly, the recent forest fires will generate new research on effective management of forest resources.

Constraints include the high property tax on commercial and industrial properties that could limit the potential for industrial machinery and other industrial development. There is a need to improve educational outcomes that support local workforce quality. Finally, infrastructure does act as a constraint in Gila County for long-term development, with needs for road improvements, improved telecommunications, and distribution systems for water.

8.5.5 Economic Outlook

The outlook for the CAAG regional economy is moderate relative to the rest of the state. Its limited industrial structure with a still-high dependence upon government employment ensures some employment and income stability but limits the potential for accelerated growth rates in the coming years. The large role of agriculture in the economy also leads to a risk of volatile income growth from year to year.

Economy.com's baseline outlook calls for moderate real per capita income growth of 0.3% per year during the coming ten years. This is the lowest projection of any of the six

regions in the state. The economy will expand, based on continued retiree migration, increased urbanization of the I-10 corridor in the vicinity of Casa Grande, expanded tourism activity and some industrial diversification. Employment growth is projected to average 3.2% per year during the coming decade.

An alternative high growth projection based on improved measures of comparative advantage brings real per capita income growth to 2.0% per year. This remains slower than the high alternative projections for the other regions of Arizona. This scenario, however, would lift CAAG's income growth above the 1.6% baseline rate projected for the U.S. CAAG's employment growth projection in the high scenario reaches 3.8% per year.

On the downside, a reduction of measures of comparative advantage result in an annual decline in real per capita income of 0.8% per year. Employment growth falls in this scenario to 2.8% per year. This scenario is quite unlikely given current state policy that, for example, is focusing on improving public education spending. However, it does illustrate the level of risk for a region that currently underperforms, and accentuates the urgency of initiatives to diversify the economy and improve its competitiveness over the long term.

8.5.6 Foundational Issues

Foundational issues in the CAAG region mirror those identified as statewide concerns. The first is tourism. It is assumed that tourism will continue to be a driving force for the economy going forward, particularly for Gila County. Its natural resources and scenic beauty, its proximity to the Phoenix metropolitan area and the casinos already located within the region generate good potential for the industry. Yet aside from amusement and recreation services, few tourism-related industries emerge as driving basic industries in the economy. Thus, there appear to be many opportunities to diversify tourism activities that could increase value to the industry and increase wages paid to those working in the industry.

Second, financial services is not expected to be a driving basic industry for this region, but economic diversification of the region would be benefited by greater access to capital within the region, particularly lending programs related to small business and industry.

Third, as with the other more rural regions of the state, improvement of education outcomes and a general improvement of workforce quality through post-secondary education and training programs would support improved productivity and could be linked closely to other economic development programs within the region.

Fourth, improved access to basic and higher-level healthcare facilities would help to further attract workforce migrants, particularly in Gila County where access to advanced care facilities in Phoenix and Tucson is more limited.

Additionally, as mentioned in earlier sections, there will be continued need for improvement of infrastructure support for the economy. In Pinal County, this is related to continued improvement of I-10 and I-8 to avoid congestion as the local economy expands and traffic flows through the region rise. There will also be a need for expanded and improved water distribution and management as urbanization expands and water use shifts from agriculture to urban uses.

Without any interstate highway access, it becomes imperative in Gila County to continually improve state and local highways to accommodate increasing truck and auto traffic. Perhaps more importantly, improved telecommunications access would improve its critical links to Phoenix and to the broader global economy. This not only links employment opportunities to the broader economy, but also provides links to education and healthcare that increasingly utilize telecommunications to provide services to the smaller communities and rural areas of Arizona.

8.6 Southeastern Arizona Governments Organization (Cochise, Graham, Greenlee and Santa Cruz Counties)

8.6.1 Current Economic Trends

SEAGO's economy did not escape the recession as employment fell rapidly in late 2001 and the early months of 2002. According to the Arizona Department of Economic Security, however, conditions began to improve by the second quarter of 2002 with employment rising and unemployment rates beginning to return to long-term trends. Manufacturing and mining employment fell the fastest during the recession, but their payrolls account for a small share of the region's total. Government accounts for over 30% of employment. Government employment has risen since the beginning of the year and trade and services are holding steady.

The Fort Huachuca army base and the Nogales border crossing are also crucial to the SEAGO economy. The Fort Huachuca base anchors the Cochise County economy, which accounts for nearly 65% of economic activity in SEAGO. Military personnel spending is a key driver for trade and service industries in the entire region. Similarly, the Nogales border crossing in Santa Cruz County is a key transit point for winter produce, and has helped SEAGO attract a significant wholesale trade and distribution economy. Mining is concentrated in Greenlee County, where Phelps Dodge operates its mine and smelting operations near Morenci. Further stability is added to the region's economy by state and federal prisons located in Graham and Cochise Counties. Finally, federal employment related to customs, immigration and naturalization and the border patrol supports payrolls in Santa Cruz and Cochise Counties.

8.6.2 Industrial Structure

Leading and lagging basic industries. As mentioned above, SEAGO's economy is driven to a large degree by state and federal agencies and mining. Tourism, agriculture and international trade and transport also are important components of the economy. Indeed, these are the primary factors that emerge as the driving basic industries of the economy (see Table 24).

As indicated by its industrial structure and by its relatively moderate pace of growth over the past decade, however, it may be concluded that SEAGO is the least dynamic economy of Arizona's six regions. The two dynamic basic industries in the region, i.e. those growing very quickly and increasing their concentration within the region, are very small and connected less to the region's export base than to demand arising from other basic industries. General building contractors are likely tied to continual improvement of government facilities in the region, particularly related to the increased federal presence along the border during the past several years and improvements at prison facilities within the region. Miscellaneous business services is a collection of service industries that reflect changing business practices and the outsourcing of service activities. Thus, neither of the dynamic industries truly point to any significant changes in the broad underlying structure of the economy.

The growth industries are state and federal government. While an expanding presence of government employment is positive for the region, it does not illustrate any diversification of its economy or sources of its growth. Indeed, an expanding dependence upon federal and state payrolls puts the region at risk over the long term should changes in government policy begin to reduce their activities in the region. Federal employment is concentrated in Cochise County related to civilian defense work at and near Fort Huachuca. State employment is the

Table 24: Characteristics of SEAGO Basic Industries**Dynamic Industries**

15	General building contractors
738	Miscellaneous business services

Growth Industries

GVS	State government
GVF	Federal government

Stable Industries

102	Copper mining
701	Hotels and motels
ML	Military

Deconcentrating Industries

473	Arrangement of freight transport
-----	----------------------------------

Note: SEAGO consists of Cochise, Graham, Greenlee, and Santa Cruz counties

most concentrated in Graham County due to its state prison. Graham also hosts a federal prison, which adds to its government employer base.

Stable industries include direct military employment, hotels and copper mining. Military employment is, again, related to Fort Huachuca. Hotels indicate the importance of tourism for this region of small towns, rural areas and historic sites. Copper mining refers to the over 2,000 workers at the Phelps Dodge facility in Greenlee County.³² Mining is Greenlee's primary economic activity.

While the number of dynamic industries in SEAGO is few, so is its number deconcentrating industries. The arrangement of freight transportation, which is concentrated in Santa Cruz County and related to cross border trade at Nogales, is the only basis industry fitting this category. While this industry is classified as deconcentrating, its payroll has indeed risen over the past ten years. But the increase has been moderate and well below the pace of growth of the region's other basic industries. It is ironic that during this period in which Nafta was implemented and cross border trade has expanded that this industry so closely related to trade remains a small industry that has not increased its relative concentration in the regional economy.

SEAGO is the second least diverse regional economy in Arizona. Only WACOG ranks behind the region. SEAGO diversity index of 0.04 is quite low compared to 1.0 benchmark for the nation (see appendix). Military, tourism and mining are the dominant industries of the region. Within SEAGO, Cochise and Graham counties are much more diverse than Greenlee or Santa Cruz. Indeed, when basing the diversity index on the Arizona economy, Graham County ranks in the middle of the 15 counties.

8.6.3 Measures of Comparative Advantage

8.6.3.1 Population

As there is little dynamism to SEAGO's economic structure, the same can be said for population, although it is important to note that these are all relative terms. SEAGO's population growth of 2.0% during the 1990's is the slowest of all six regions of the state and well below the 3.4% statewide average for the decade (see Chart 98). To be sure,

³² Employment data is from Phelps Dodge's web site.

SEAGO's population growth is still double the national average and thus the area is still expanding at a rapid rate, but not nearly to the extent that the rest of the state is.

SEAGO's population has a much smaller impact from migration than any other region. In 2001, the Census Bureau estimates that net migration accounted for just over 20% of population growth. The gap is quite wide between SEAGO and the next ranking region, NACOG, where net migration accounted for about 60% of total population growth. In fact, SEAGO is the only region in which the migration contribution to population growth was far from the statewide average of about 70% in 2001. The components of migration do indeed differ from region to region as its composition shifts from domestic working-age households to retirees to international immigrants. But SEAGO's population growth has a much smaller influence from any of these.

The retiree component of population in SEAGO is rising slowly, but still differs little from the statewide average. According to the 2000 census, the population greater than 55 years old in SEAGO accounted for 23% of total population, just above the statewide average and about equal to the NACOG region. Indeed, within SEAGO, retirees have a large influence only in Cochise County, where the 55 and over population accounts for 25% of population. Moreover, this is a relatively recent phenomenon, rising from 22% in 1990 and 20% in 1980. Previously, the older share of population in Cochise County differed little from the rest of the region.

Consequently, SEAGO's population is younger than average, although not by a wide margin. The population under 20 accounts for 34% to 36% of the population in Greenlee, Graham and Santa Cruz counties, versus 30% statewide and 29% nationwide. But these shares are also falling faster than nationwide, so that the age distribution in these counties looks more similar to U.S. patterns with the passing of time. Cochise County's under-20 population share of 29%, is now equal to the national average. Thus, in terms of population growth and age composition, SEAGO's trends are closer to the national average than any other region in Arizona.

8.6.3.2 Income

SEAGO's per capita income of \$14,800 in 1999 was the lowest of the state's six regions according to the 2000 census. The statewide average, of course, is skewed upward by higher

Chart 98: Population Growth, Southeastern Arizona

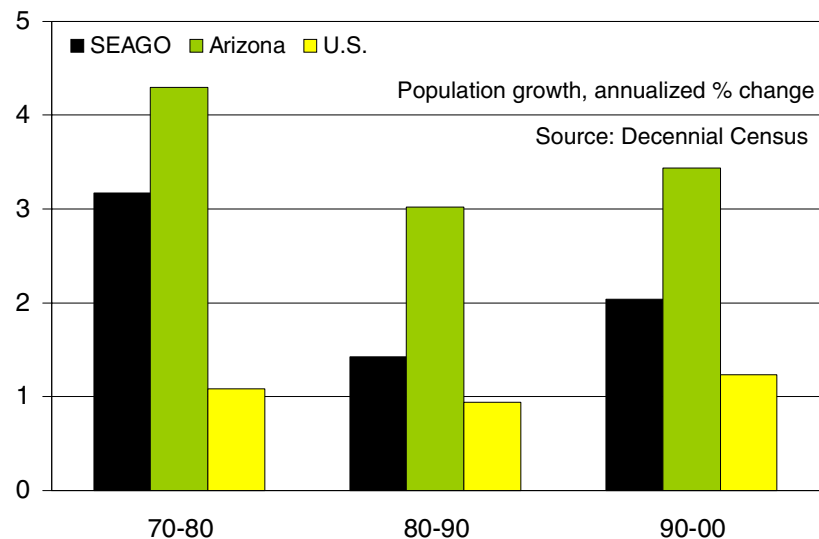
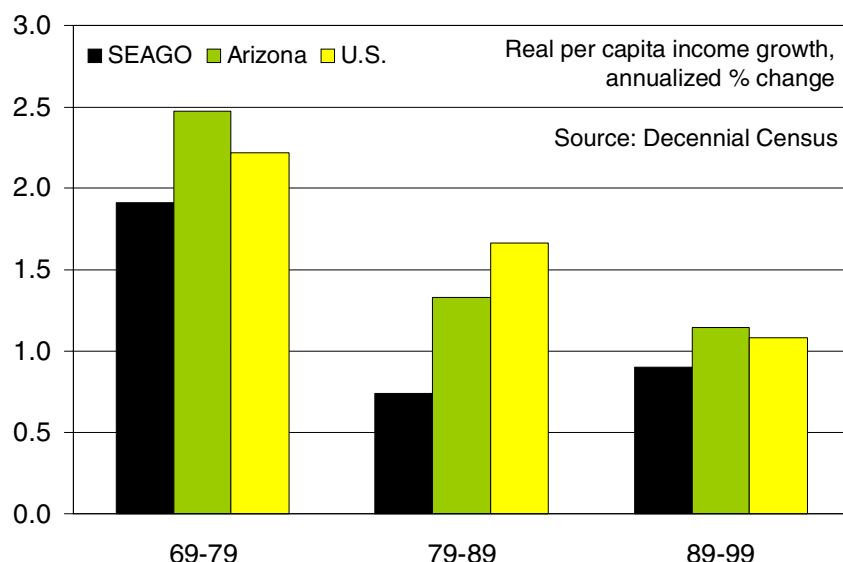


Chart 99: Income Growth, Southeastern Arizona



incomes earned in Phoenix and Tucson. But even CAAG's income exceeded \$16,000 per person and income in WACOG and NACOG was approximately \$15,700.

Moreover, SEAGO has not gained much ground over the past decade (see Chart 99). Real per capita income growth did exceed that of WACOG, but nowhere else. In particular, it fared rather worse than CAAG and NACOG, the other two less urbanized regions, which experienced the fastest per capita income growth over the 1990s according to census data.

Cochise and Greenlee Counties lead the region for per capita income with \$16,000 and \$15,800, respectively in 1999. The higher incomes in these two counties illustrate Cochise's higher-paying federal government jobs and its more diversified economy, as well as Greenlee's mining-based economy. Income in Graham and Santa Cruz were lower at \$12,100 and \$13,300 per capita, respectively. The influx of lower-skilled migrants from across the border also places downward pressure on per capita income in the region.

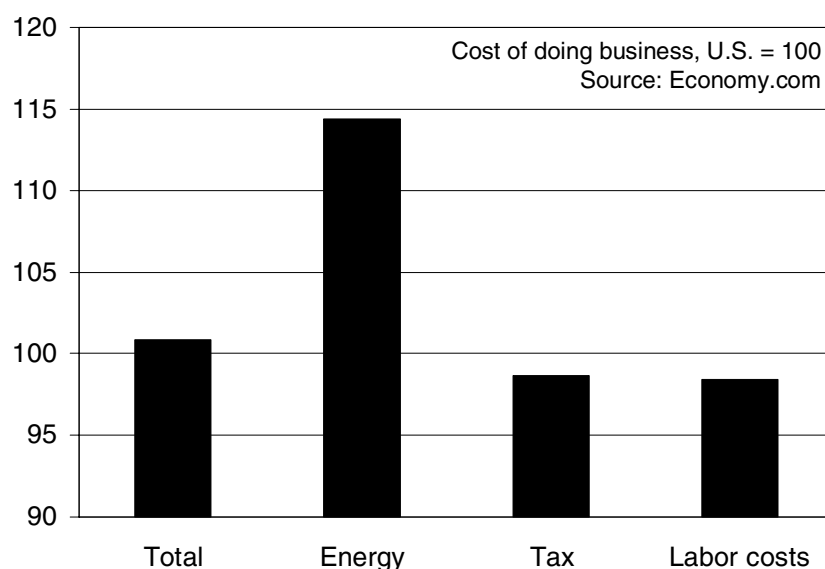
Most disconcerting is that the region is barely holding its own with regard to per capita income. Over much of the last half century, the region has experienced a growing gap with the national average. That gap continued to widen moderately during the 1990s, although the pattern differed across the region. For example, per capita income as a share of the U.S. average remained unchanged between 1989 and 1999 in both Cochise and Santa Cruz Counties. Moreover, the same measure improved in Greenlee County, although this is a less than perfect measure because income and employment in Greenlee County can be volatile from year to year with changing copper prices. But per capita income in Graham County fell from 62% of the U.S. average to 56% over the ten years between 1989 and 1999.

The expanding presence of federal employment is an important factor in keeping the border Counties of Cochise and Santa Cruz more stable than the inland counties of Graham and Greenlee.

8.6.3.3 Cost of Doing Business

While business costs in SEAGO are above the national average, the region has some distinct cost advantages compared to the rest of the state. Unit labor costs and low taxes are SEAGO's greatest advantage (see Chart 100). They are below the U.S. average and do not differ greatly from the other regions within Arizona. Its unit labor costs are

Chart 100: Cost of Doing Business, Southeastern Arizona



marginally lower than the other six regions and its tax burden is second lowest, after MAG. The differences are very small, but the low tax burden is particularly significant since it is measured relative to total personal income, and SEAGO's income on a per capita basis is the lowest in the state. Energy costs are on par with the rest of the state. They are considerably higher than in neighboring New Mexico, but as with all Arizona regions, they are significantly below energy costs in California. Thus, SEAGO ranks near average for the U.S. with regard to its overall cost index and the overall cost of doing business does not appear to be a detriment to the region.

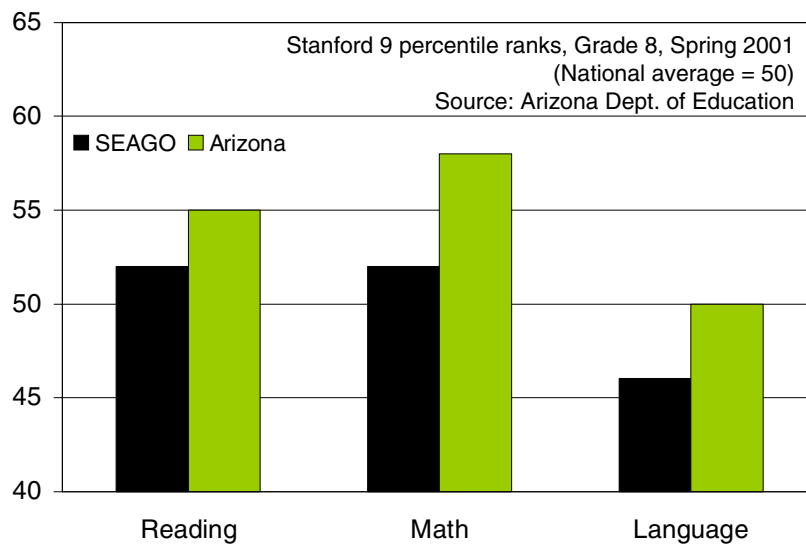
8.6.3.4 Cost of Living

Similar to the cost of doing business, SEAGO also has one of the lowest costs of living in the state. A proxy for living costs, housing affordability in SEAGO is the highest in the state, well above the national average. Economy.com's housing affordability index indicates that a household in SEAGO earning the median income can afford a house that costs 36% above the median existing home price, about equal to the U.S. average. These averages, however, do hide some difficulties with the area's housing markets. For example, housing is rather affordable for federal and state employees but less affordable for those working outside of government. The problem is particularly evident in the border counties of Cochise and Santa Cruz, where federal workers tend to occupy the better housing stock. It is less affordable for other workers, and indeed, some of the better housing may become monopolized by federal workers as they rotate through posts in the area. So affordability can become a problem in certain markets within the region.

8.6.3.5 Education and Workforce Quality

Measures of education and workforce quality show some positive contribution to the competitiveness of the economy, although as with most of the more rural regions, results do differ by county. For example, in terms of measures of education outcomes the region competes well. Achievement scores for eighth graders rank above the 50-percentile mark for both reading and math, the only region outside of MAG and PAG to do so (see Chart 101).

Chart 101: Eighth Grade Proficiency, Southeastern Arizona



Cochise and Greenlee counties are the ones that support the region's relatively good proficiency scores. Graham County students did score in the 51st percentile for math in 2001, but in the low to mid 40s for reading and language. Santa Cruz County students scored in the low 40s for all three measures. So in the aggregate, the region's measures of educational proficiency are good, but they are unequally distributed within the region.

The dropout rate for SEAGO's high school students also ranks well for the state. At 10%, it is the second best among the six regions in 2001, with only MAG's rate lower at 9.0% according to the Arizona Department of Education. Public spending per pupil is also about average for the state in all of SEAGO's counties, except for Greenlee County where it ranks lowest among the state's 15 counties. Greenlee's aggregate figure itself is skewed downward by wide differences in assessed valuation and spending between schools in Morenci, home of the Phelps Dodge copper mine, and other locations within the county.

With migration accounting for a relatively small share of population growth, it is a smaller influence on workforce quality than elsewhere in the state. SEAGO's 16.7% share of the adult population with a bachelor's degree is below Arizona's statewide figure of 23.5% (see Chart 102). Here again, however, figures differ between counties. Cochise and Santa Cruz counties rank 5th and 6th while Greenlee and Graham counties rank 9th and 11th. College attainment, amounting to 18.8% in Cochise County and 15.2% in Santa Cruz County, is likely supported by two factors. First is the federal workforce, which to a certain extent requires a college degree. Second is the rising share of retiree households in Cochise County, which also generally are well educated. Greenlee's college attainment is 12.2% of the adult population. Attainment for Graham County is 11.8% according to the 2000 census.

Productivity in SEAGO is quite good, remaining about equal to the national average and the statewide average over the past 30 years (see Chart 103). Measures of productivity are supported by several factors. First, the SEAGO economy has not seen a rapid rise in the number of low-wage jobs as seen in parts of WACOG, for example. Second, federal employment, particularly relating to the military and to the border patrol, has been supported by wage increases in recent years. In the absence of specific goods and services being produced at a market price, productivity for the government is measured by wages per worker. Third, despite volatile prices, productivity in the mining

Chart 102: Educational Attainment, Southeastern Arizona

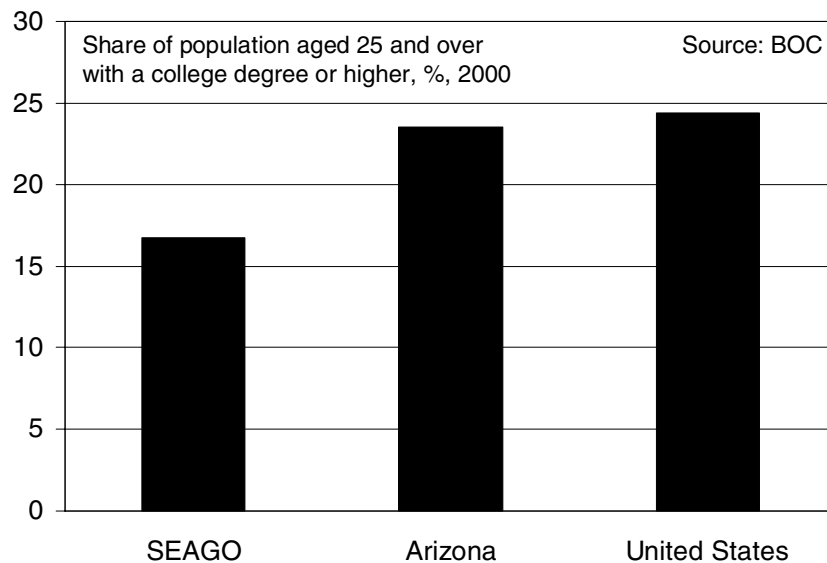
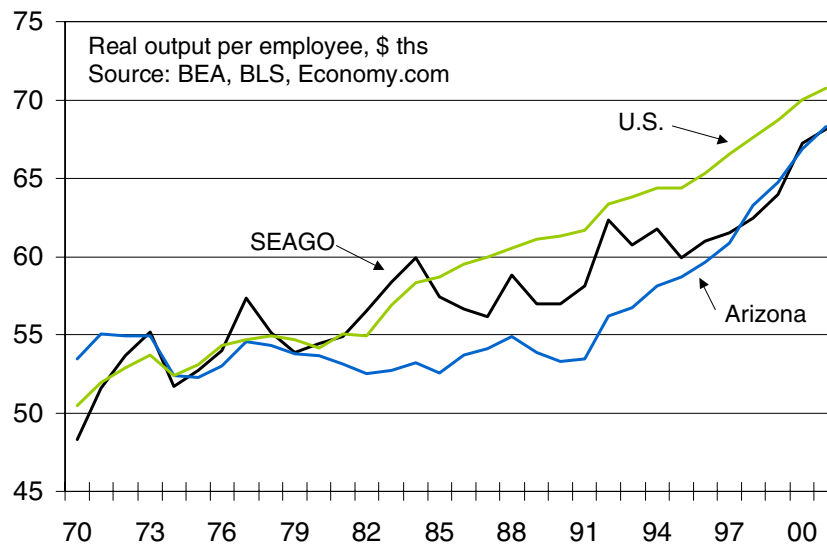


Chart 103: Productivity, Southeastern Arizona

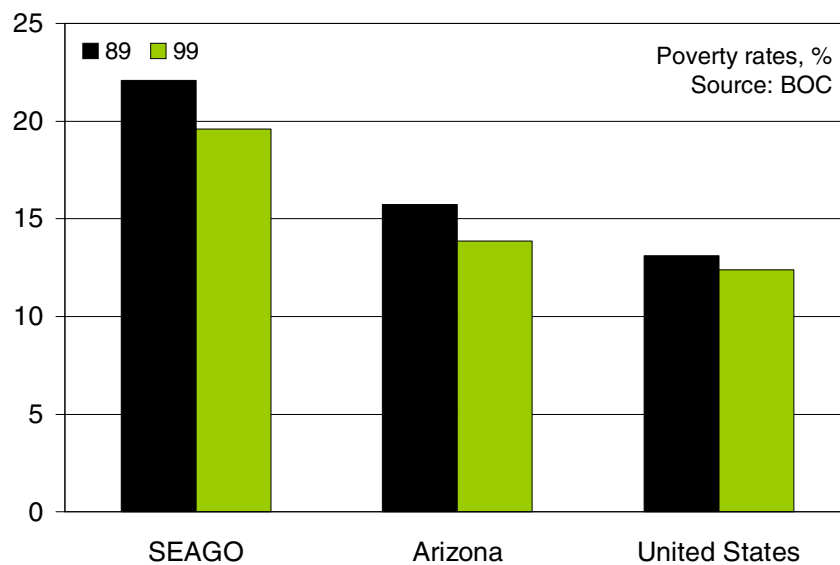


industry, which accounts for over 15% of SEAGO's total gross regional product, has risen consistently over the years.

8.6.3.6 Health, Welfare and Crime

These measures of quality of life further illustrate the diversity of the economy across the four counties that make up the SEAGO region. For example, the poverty rate in Greenlee County is the lowest among Arizona's 15 counties at just under 10%, well under state and national figures according to the 2000 census. The rate in Cochise County was 17.7%, which is about equal to many of the counties that make up the more rural regions of the state. Finally, rates in Graham and Santa Cruz counties are nearly 25% according to the census, among the highest in the state and exceeded only by Apache and Navajo counties in northern Arizona. Overall, the 19.6% rate in the region is second highest

Chart 104: Poverty Rate, Southeastern Arizona



behind NACOG. The rate did fall between 1989 and 1999 as it did nearly everywhere else (see Chart 104). The rate fell in each county over the ten-year period, but only moderately so.

Measures of health are generally good for SEAGO. Overall mortality rates are about average and infant mortality rates are among the lowest throughout the state (see Chart 105). The low infant mortality rate is a particularly good indicator of good public health, although it could be biased downward if problem pregnancies are handled with frequency in Tucson or Phoenix. But SEAGO's low teen birth rate may also help keep problem pregnancies at bay, and is a good general indicator of overall health and welfare.

A final measure of quality of life is a rather low rate of crime (see Chart 106). Similar to Arizona's other rural regions, the rate is below that seen in Phoenix or Tucson and below the national average.

Chart 105: Infant Mortality Rate, Southeastern Arizona

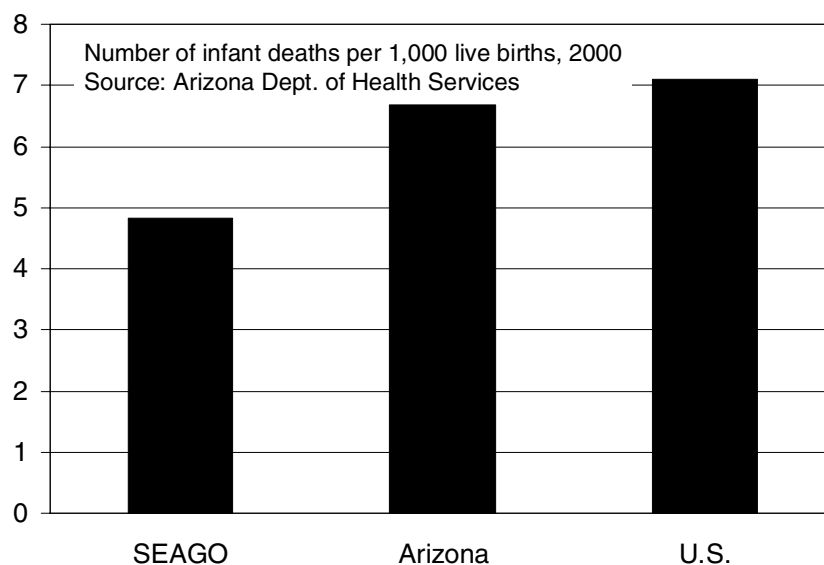
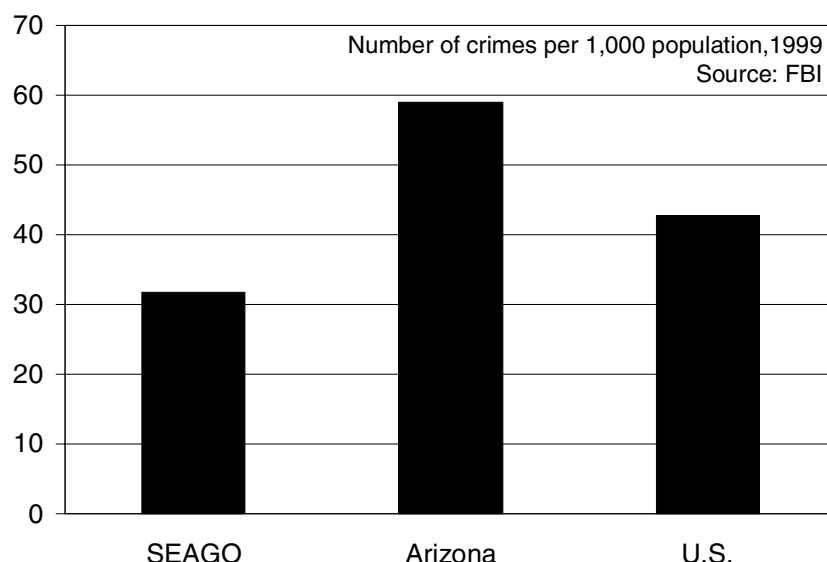


Chart 106: FBI Crime Index, Southeastern Arizona



Thus, these overall measures of quality of life, combined with the scenic, historical and cultural attractions of the SEAGO region provide considerable advantage going forward. The region's economy is less than dynamic and its growth rate is moderate for the state, yet it offers a number of comparative advantages that should support the economy in the coming years.

8.6.3.7 Infrastructure

While quality of life generates considerable advantage, SEAGO's infrastructure represents some challenges for the future. Highway infrastructure is mixed. I-10 and I-19 provide good access east to west and north to south through Santa Cruz and Cochise counties. But elsewhere highway access is limited largely to undivided state highways. Moreover, highway border crossings at Nogales and Douglas suffer considerable congestion, particularly during the peak winter season when winter crops are transported from Mexico. Graham and Greenlee counties have no direct interstate highway access, although Graham and Greenlee counties are bisected by U.S. highway 191 that runs up and down the eastern spine of the state, and Graham County has east-west access via U.S. highway 70. Road quality and congestion will become increasing concerns as the region grows.

Of even greater concern is water. The region relies mainly upon ground water for urban and agricultural use, a source that is diminishing in supply and quality. Moreover, there are issues of surface water quality along the San Pedro River as it passes through the border region and also through SEAGO's agricultural areas. There is also lingering uncertainty concerning water rights on the Gila river, due to pending adjudication between Graham County and the Gila River Indian reservation.

And finally, access to broadband telecommunications is limited in many of SEAGO's communities. Nogales is provided with long-haul fiber-optic cables by both AT&T and Telmex, and a T1 line runs from Greenlee's county seat through Graham County into Phoenix along U.S. highway 70, but other major centers lack such service. For example, the City of Sierra Vista has an Information Technology Task Force that is addressing the issue of telecom infrastructure and is assessing the availability of information technology services in the region. It is perceived that the lack of broadband access limits the ability of the region to attract self-employed or long-distance workers that might otherwise enjoy the region's quality of life.

8.6.4 Economic Opportunities

SEAGO's location near the border, its diverse climatic and topographic regions, and its historical and cultural resources offer a number of opportunities for the economy going forward. Its current industrial structure is rather limiting, however. In the near term, expansion of federal military and border security spending provides some upside potential for employment and income in Cochise and Santa Cruz counties. But this provides no long-term guarantee and only moderate stimulus to the private sector. Indeed, federal budgets can contract as fast as they rise, as was evident during the first half of the 1990s. Among other industries that currently drive the economy, only tourism offers good long-term potential as travel spending by baby boomers and their children should rise in the coming decade. Further potential arises for additional growth through in-migration as parts of the region may become better known as retirement destinations.

Further economic potential, however, may include:

- Industrial machinery
- Transportation/Logistics
- Agriculture/Food processing/Agricultural technology
- Defense-related industries

The I-10 corridor, including the passenger and commercial rail service that runs parallel to I-10 in SEAGO, provides good potential for industrial development in the region. Industrial machinery illustrates this potential. Currently there is little manufacturing activity along the corridor, yet the highway creates good access to markets, particularly in the Southwest. Relative to other regions of Arizona, however, SEAGO is the farthest distance from southern California markets.

Transportation and logistics offer very good potential for the future of the region. Two of Arizona's primary ports of entry from Mexico are located in Santa Cruz and Cochise Counties. With manufacturing in Mexico expected to shift further to the south over the long term, border crossings at Nogales and Douglas become one day or more driving distance from major centers on Mexico's western coast. Thus, rather than simply serving maquiladora plants along the border, Nogales and Douglas become the first points of access in the U.S. along a longer trade corridor that can serve as a node for transport and logistics services for goods traveling between Mexico and U.S. points of origin and destinations on the west coast and in the Mountain states. Already there is some work being undertaken to coordinate shipping needs on both sides of the border. But there is much to be done in the future. Congestion needs to be reduced at the border. Processing across the border needs to be accelerated. Better telecommunications links on both sides of the border would help. Modern warehouse facilities are needed. Increased length of limited-access highway along Mexico's west coast would provide further long-term stimulus. Joint research with the University of Arizona's research centers, particularly the Advanced Traffic and Logistics Algorithms and Systems (ATLAS) center, offer further potential.

Agriculture and food processing provide further opportunity for SEAGO's agricultural valleys. Additional processing of farm commodities would add value and broaden sources of income from agricultural resources. Given the limited sources of water compared to other farming regions in the state such as in Yuma, Maricopa and Pinal Counties, improved irrigation technology would support the industry over the long term, making more efficient use of limited water resources in the region.

Increased research and procurement activities related to Fort Huachuca also offer potential over the coming decade. Given the uncertainty of the pace of defense spending

beyond the next five years, however, a combination of research and technology with both defense and commercial applications would offer greater long-term potential for the region. Increased research activity connected to the development of telescope facilities atop Mt. Graham, and the Southwest Research station of the American Museum of Natural History in Cochise could also stimulate SEAGO's economy.

While tourism is not specifically mentioned as an economic opportunity because it is assumed that tourism and retirement migration will continue to grow in the region, it must be mentioned that SEAGO has multiple resources to expand these activities. The region has Chiricahua Peak which exceeds 9,000 feet and Mt. Graham exceeding 10,000 feet in elevation, along with numerous historic sites and parks. Moreover, it has transport links to northern Mexico, and it includes the southern stretch of U.S. highway 191 that completes a large circular route that links I-10 and I-40 through Tucson, Phoenix and Flagstaff with Arizona's natural, cultural and historical resources along the entire eastern edge of the state.

There are a number of constraints that are faced by the region, and they focus on adequate infrastructure to support future growth of the economy. Water supplies and distribution, transportation systems and workforce quality each need to be addressed to support the economy going forward.

8.6.5 Economic Outlook

The outlook for SEAGO is good. Its productivity is higher than average for a less urbanized region and it can count on rising federal spending to support the economy. Thus, the outlook for income growth is rather good. Economy.com's baseline forecast projects real per capita income growth of 1.5% per year over the 2002-2012 period. This ranks SEAGO as the third fastest growing region as measured by per capita income behind MAG and PAG. The pace of workforce migration is expected to remain moderate, keeping employment growth down to a 1.7% annualized rate, which will be the slowest among the six regions. Limited access outside of the interstate corridors, distance from the Phoenix and southern California economies, and limited telecommunications infrastructure each generate some friction on economic growth, even as it may enhance some perception of quality of life, maintaining the area's rural and less frenetic pace.

Economy.com's modeling system projects that, under assumptions of improved measures of comparative advantage outlined in Section 6, income growth could accelerate to a high scenario of 3.2% per year and employment growth could rise to 2.3% per year. Moreover, given the region's productivity that is near the state and U.S. averages, a low scenario under worsening measures of comparative advantage still produces positive real per capita income growth. It is the only region outside of MAG and PAG that maintains a positive growth rate for income under the low scenario assumptions. Employment growth under the low scenario falls to 1.3% per year.

8.6.6 Foundational Issues

A number of constraints to the economy have been discussed that reflect the need to improve some of the underlying foundations of the economy. Already discussed is the opportunity to enhance tourism as a tool for economic development. Enhanced tourism opportunities not only would add to the economic base of the region, but also as in other areas, would likely help to entice a share of visitors to return some day as residents, either in retirement or while still working. Given a number of communities with attractive environments in the region, there is potential of attracting the self-employed or distance workers, if they can be served with the broadband access that would be needed to link to clients or employers in other regions or states. Thus, telecommunications also becomes a

foundational issue for the region's economic future. The distribution of other infrastructure such as water and highways similarly pose issues for improvement of the economy's underlying foundation. Also, if independent entrepreneurs are to be attracted to SEAGO, then adequate sources of financing to deal with their needs on an ongoing basis need to be in place in the region. Education and workforce quality are problematic, as they are nearly everywhere in the state, although measures of educational outcomes are better in SEAGO than in many of the other regions. Finally, healthcare is an issue as it supports the long-term growth of the regional economy. A lack of acute-care facilities often makes it difficult for households to remain in this region with its somewhat limited access if there are medical conditions to be cared for. Economic development officials cite this as a limiting factor of the region's economy over the long term.

Appendix: Diversity Index, Arizona Counties and Regions, 2000/2001

Area	Base: Index	Arizona = 1.0 Rank	Base: Index	U.S. = 1.0 Rank
Arizona			0.45	40
WACOG	0.28	6	0.01	6
Mohave	0.37	4	0.30	4
La Paz	0.06	14	0.01	12
Yuma	0.12	9	0.00	13
NACOG	0.46	3	0.07	3
Coconino	0.42	3	0.47	2
Yavapai	0.33	6	0.18	7
Navajo	0.11	10	0.07	9
Apache	0.10	12	0.00	14
MAG	0.93	1	0.67	1
Maricopa	0.93	1	0.67	1
CAAG	0.35	4	0.07	4
Pinal	0.36	5	0.05	10
Gila	0.10	13	0.04	11
PAG	0.65	2	0.35	2
Pima	0.65	2	0.35	3
SEAGO	0.31	5	0.04	5
Graham	0.32	7	0.24	5
Greenlee	0.01	15	0.00	15
Cochise	0.23	8	0.23	6
Santa Cruz	0.10	11	0.08	8

Industrial diversity is defined as the extent to which a state's industrial structure approximates the base industrial structure.

Diversity is derived using the following formula: 0 means it has a totally different industrial structure than the BASE.

Diversity = $1 / \sum ((EMP_{ij} / EMP_{BASEj}) * EMP_{ij})$

Where EMP = share of employment in three-digit SIC industry j during period 2000-2001;

i = local area

BASE = either Arizona or the U.S.

The Diversity measure is bounded between 0 and 1. 1 means the area has the same industrial structure as the BASE.

The formula is derived from the Hachman Index, Bureau of Business Research, University of Utah, 1994.

Source: Economy.com, Inc.